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Instruction Manual

Model 4671
IF/Baseband Analyzer

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MODEL 4671

IF/BASEBAND ANALYZER

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Fourth Edition

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SCIENTIFIC-ATLANTA, INC.

163286

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INSTRUMENTATION

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CHAPTER 1
GENERAL INFORMATION

1.1 GENERAL

1.1.1 This manual contains information necessary for the proper installation, operation, maintenance, and adjustments for the Scientific-Atlanta Model 4671 IF/Baseband Analyzer. A replacement parts list, component location illustrations, and schematic diagrams are also included. When changes are made to any of the above, the changes will be identified and described in a notice following the title page.

1.2 PURPOSE OF EQUIPMENT

1.2.1 The Model 4671 IF/Baseband Analyzer is designed to assist in measuring microwave radio performance such as required by demand maintenance programs for microwave relay lines. Demand maintenance programs consist of scheduled periodic testing which enables an operator to recognize gradual deterioration of the transmission parameters before they adversely affect the system.

1.2.2 Tests, such as measuring Noise Power Ratio (NPR), the baseband response and the tone search can detect gradual failure in a switching section. Selected IF testing allows an operator to monitor the carrier frequency and measure carrier-to-interference (C/I), cross polarization discrimination (XPD), and to test side-to-side coupling. The results of each test are monitored by the front panel analog and digital meters, and are also permanently recorded using the Model 4673 X-Y Recorder.

1.3 GENERAL DESCRIPTION

1.3.1 Model 4671 IF/Baseband Analyzer (See Figure 1-1): The Model 4671 IF/Baseband Analyzer is an independent unit measuring 6.2 inches high by 18.6 inches wide and 18.8 inches deep. It operates from 110/220 volt, ±10%, 47 to 63 Hz, ac source, and weighs approximately 35 pounds. The Model 4671 IF/Baseband Analyzer is designed to function as a spectrum analyzer, a selective level meter, and a white noise receiver. Baseband input power levels between +10 dBm and -120 dBm are accurately measured for frequencies between 10 kHz and 12.5 MHz. The IF power levels between +10 dBm and -105 dBm are accurately measured for frequencies between 35 MHz and 105 MHz.

1.3.2 Front panel displays provide both the frequency indication and the actual input power level. Front panel controls are provided which complete internal test configurations of all parameters so that no manual selections are needed when changing test modes. The input attenuator is controlled by front panel switches to provide a 30 dB attenuation range in 1.0 dB increments. Similarly, the reference attenuator is controlled by front panel switches to provide a 50 dB attenuation range in 1.0 dB increments.

1.3.3 Model 4673 X-Y Recorder (See Figure 1-2): The Model 4673 X-Y Recorder is an independent unit measuring 10.5 inches high by 17.2 inches wide and 5.3 inches deep. It operates from 110/220 volt, ±10%, 47 to 400 Hz ac source and weighs approximately 16 pounds. The Model 4673 X-Y Recorder is directly driven by the Model 4671 IF/Baseband Analyzer through the 148674 interconnecting cable. The Model 4673 X-Y Recorder features lightweight rugged construction. Fiber tip pens are used to produce permanent plot records of baseband and IF amplitude versus frequency tests on 8-1/2 x 11 inch graph paper.

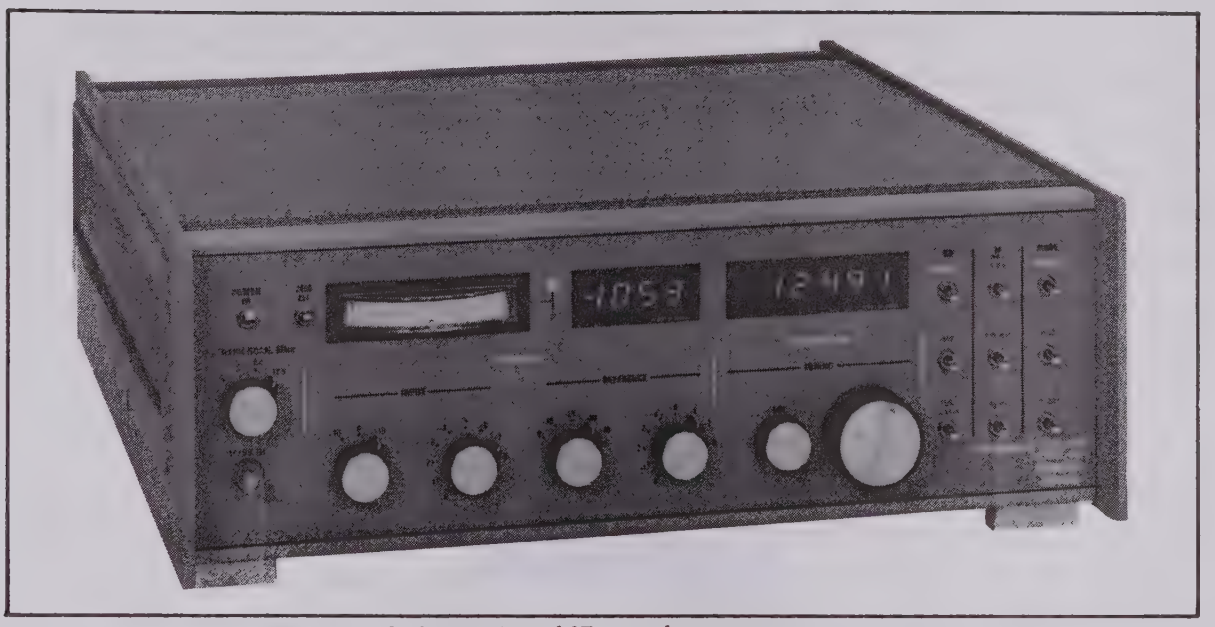

Figure 1-1. Model 4671 IF/Baseband Analyzer

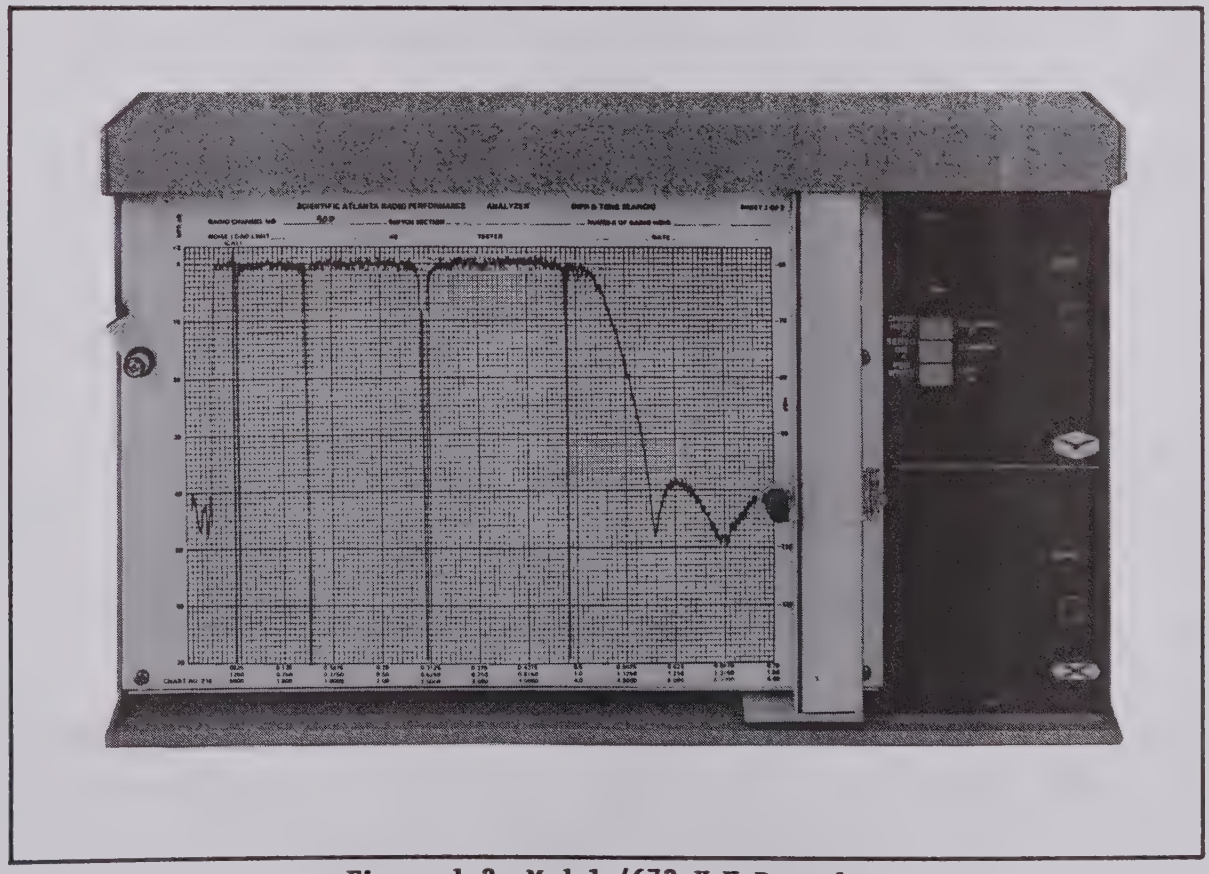

Figure 1-2. Model 4673 X-Y Recorder

1.3.4 Optional Transportation Cart and Carrying Cases:
The optional moving/storage Cart (SA Part No. 253559) as shown in Figure 1-3, provides a convenient method of relocating a Model 4671 Analyzer and a Model 4673 X-Y Recorder within a radio site. Its' five position locking "adjustable-angle" table, allows proper visual inspection of both units under various testing environments. In addition, locking heavy-duty casters help to insure smooth, yet solid positioning of the cart and its contents.

1.3.5 Both carrying and shipping cases (Figure 1-4) are available by option for the Model 4671 IF/Baseband Analyzer. Hard cover shipping cases provide the protection during air or surface transportation between operating locations. Soft cover carrying cases provide similar protection for transporting the instruments around radio sites and in company vehicles. The soft cover carrying case includes extra space for power cables, control cables, and other associated accessories. The shipping and carrying cases available are identified as follows:

Model 4672-1: Soft cover carrying case for Model 4671 IF/Baseband Analyzer

Model 4672-2: Hard cover shipping case for Model 4671 IF/Baseband Analyzer

Model 4673-1: Hard cover carrying case for Model 4673 X-Y Recorder (Although this is a hard case, it is not intended for shipping purposes)

Model 4673-2: Hard cover shipping case for Model 4674 X-Y Recorder

1.4 TECHNICAL CHARACTERISTICS

1.4.1 Prior to assigning the Model 4671 IF/Baseband Analyzer into normal maintenance operation, the technical characteristics listed in Table 1-1 should be reviewed by both the operational and

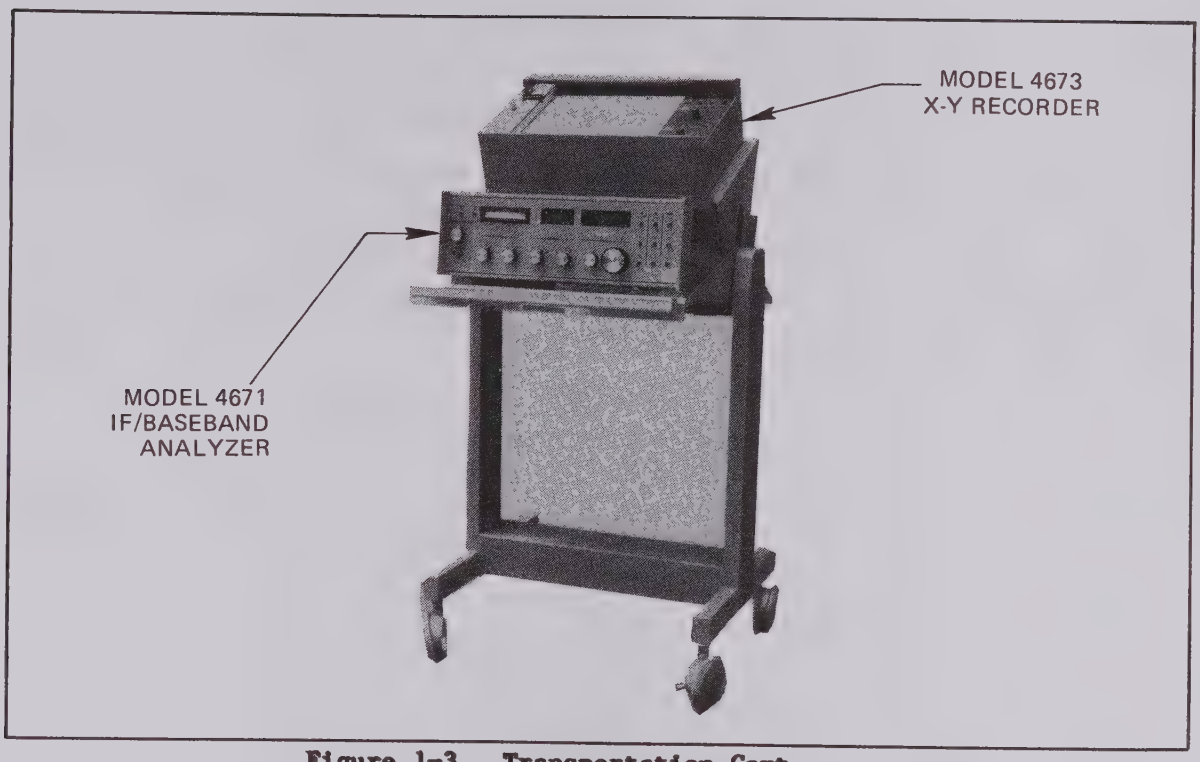

Figure 1-3. Transportation Cart

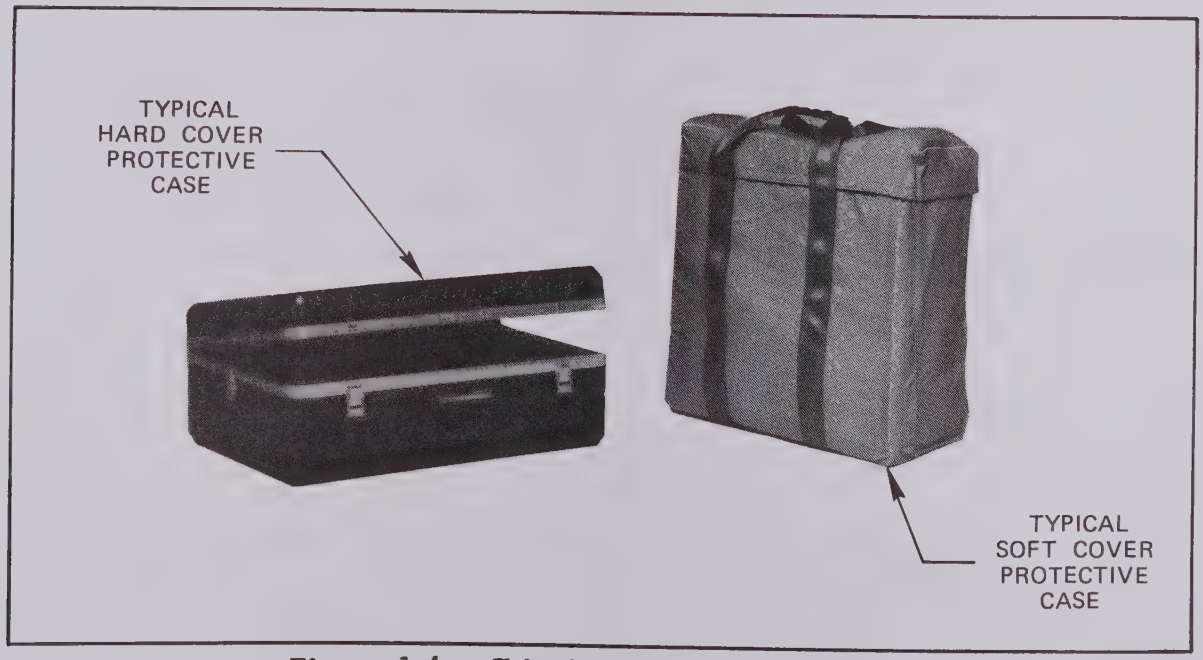

Figure 1-4. Shipping and Carrying Case

maintenance personnel. Table 1-1 is a list of specifications to assist in understanding the limits and operational characteristics that may be expected from the individual instruments illustrated in Figure 1-1. Similar technical characteristics for the Model 4673 X-Y Recorder are provided in the separate X-Y Recorder manual and should also be reviewed. The Model 4673 X-Y Recorder is identical to specifications listed for Hewlett-Packard Model 7010B having options 002 and 003.

Table 1-1.
Technical Specifications

Model 4671 IF/Baseband Analyzer Specifications

Frequency Range

Baseband: 10 kHz to 12.5 MHz

IF: 35 MHz to 105 MHz

Frequency Accuracy

±15 kHz in modes using wideband filter

±1 kHz in modes using narrowband filter

Relative Level Display Accuracy

+10 dBm to -110 dBm ±3 dB any 70 dB range

(fixed 0 ±.1 dB input controls)

Frequency Display Resolution

1 kHz

Scan Ranges

Manual	Automatic
10-750 kHz	50-750 kHz
10-1500 kHz	50-1500 kHz
10-6000 kHz	50-6000 kHz
10-12500 kHz	50-12500 kHz
65-75 MHz	65-75 MHz
45-95 MHz	45-95 MHz
35-105 MHz	35-105 MHz

Maximum Signal Input Level

The input circuit of the unit protects itself against permanent damage when subjected to signal levels up to +16 dBm. The analyzer can accurately measure signal levels up to +10 dBm.

Table 1-1.

Technical Specifications - continued

Maximum Sensitivity Narrowband Filter: 1.74 kHz to -120 dBm Wideband Filter: 30 kHz to -105 dBm Amplitude Response Variation 50 kHz to 12.5 MHz ±0.2 dB 35 MHz to 105 MHz ±0.5 dB
Signal Amplitude Measurement Accuracy 0.5 dB maximum for a -20 dBm signal input at 1 MHz in the Baseband Mode and at 70 MHz in the IF Mode.
Spurious Response 60 dB below the level of the input signal
Spurious Signals at the Input of the Unit With all input attenuators set for minimum loss, the level of spurious signals at the input shall not be greater than -120 dBm.

Table 1-1.

Technical Specifications - continued

Channel Loading	Filter Frequency (kHz)						
	High Pass	Low Pass	Bandstop				
12	12	60	16	56			
24	12	108	16	98			
36	12	156	16	140			
48	12	204	16	185			
60	12	252	16	240			
72	12	300	16	270			
96	12	408	16	240	394		
132	12	552	16	240	534		
192	12	804	16	394	770		
252	12	1052	16	534	1002		
312	12	1296	16	534	1248		
432	12	1796	16	534	1002	1730	
612	12	2600	16	770	1730	2438	
792	12	3284	16	1002	2438	3150	
972	12	4100	16	1002	2438	3886	
1872	12	8160	70	1002	3150	5340	7600
Minimum back to back NPR			61	66	66	66	66

Channel Loading	Filters (kHz)																
	High	Low	Bandstop														
24	12	108	16		98												
48	12	204	16			185											
60	12	252	16				240										
60	60	300		70			270										
120	60	552		70			270	534									
300	60	1296		70			270	534	1248								
420	60	1796		70			270	534	1248	1730							
480	12	2045	16	70			270	534	1248	1960							
600	60	2600		70			270	534	1248		2438						
900	316	4100						534	1248		2438	3886					
960	60	4100		70			270	534	1248		2438	3886					
1200	316	5600					270	534	1248		2438	3886	5340				
1260	60	5600		70			270	534	1248		2438	3886	5340				
1500	316	7248						534	1248		2438	3886	5340	6900			
1800	316	8160						534	1248		2438	3886	5340		7600		
2100	316	10164						534	1248		2438	3886	5340		7600	9624	
2400	316	11404						534	1248		2438	3886	5340		7600	10912	
2700	316	12360						534	1248		2438	3886	5340		7600		11700
Minimum back to back NPR			61	66	66	66	66	66	66	66	66	66	66	66	66	66	65

Table 1-1.

Technical Specifications - continued

Operating Voltage
110/220, ±10%, 47 to 63 Hz
Fuse Rating
1.50/.75 Amp, 3 AG, Slo-Blo
Dimensions
Height: 6.15 inches (15.65 cm)
Width: 18.57 inches (47.16 cm)
Depth: 18.825 inches (47.81 cm)
Weight
35 pounds (15.9 Kg)

CHAPTER 2
INSTALLATION

2.1 GENERAL

2.1.1 This chapter contains information necessary to install the Model 4671 IF/Baseband Analyzer and prepare it for initial operation. Operating instructions are provided in CHAPTER 3 - OPERATION.

2.2 UNPACKING AND INSPECTION

2.2.1 Carefully unpack the shipping cartons observing all instructions that may be printed on the carton. Separate the packing material from the main units and any packages of loose items (i.e., hardware, cables, connectors, etc.). Temporarily set the shipping cartons and packing material aside in a safe place and inspect the units and associated items, if any, for shipping damage. If damage is evident, contact both the carrier and the nearest Scientific-Atlanta sales representative immediately. Save the packing materials and shipping papers for inspection by the carrier's representative. Do not return a unit to Scientific-Atlanta without receiving specific return shipment instructions.

2.2.2 Save the shipping cartons and packing material until satisfactory operation of the Model 4671 IF/Baseband Analyzer is determined. The shipping cartons and packing material may then be used for storage or protection during further transport of the equipment if necessary.

2.3 INSTALLATION

2.3.1 The Model 4671 IF/Baseband Analyzer is shipped assembled and ready to operate. If it is to be operated at a test bench, prepare an area which is convenient and where cable lengths can be as short as possible.

CHAPTER 3
OPERATION

3.1 GENERAL

3.1.1 This chapter contains information to operate the Model 4671 IF/Baseband Analyzer. Front and rear panel controls, indicators, connectors, and components are described in tabular form for the Model 4671 IF/Baseband Analyzer (see Table 3-1), and the Model 4673 X-Y Recorder (see Table 3-2).

3.2 OPERATING PRECAUTIONS

3.2.1 The Model 4671 IF/Baseband Analyzer is designed to be both reliable and transportable from location to location. Always be sure that the fuse ratings are compatible with the ac supply source in addition to choosing an operating location where excessive cable lengths can be avoided and all interface connections are easily accessible.

3.2.2 The Model 4671 IF/Baseband Analyzer can be operated from either 110 or 220 volts ac.

Before connecting a power cord to ANY ac source outlet, be sure of the voltage present. All 110/220 voltage select options must be correctly positioned first and the proper rated fuses installed before an ac connection is made.

CAUTION

FAILURE TO OBSERVE THE PROPER OPERATING VOLTAGE AND FUSE RATING MAY RESULT IN EQUIPMENT DAMAGE.

Table 3-1.
Model 4671 IF/Baseband Analyzer,
Controls and Indicators

Control/Indicator	Function
ZERO REF Switch (A9S1)	A momentary toggle switch which, in the normal position, causes the digital LEVEL -dBm display to indicate the signal input power level. When depressed, the digital LEVEL -dBm display indicates the algebraic sum of both INPUT and REFERENCE attenuators.
LEVEL -dBm Analog Meter (A9M1)	A two scale analog indication of input level minus the algebraic sum of both INPUT and REFERENCE attenuators. Two illuminated panel indicators to the right of the analog meter remind the operator of the proper scale. When "10" is illuminated, the top meter scale is calibrated to indicate Baseband (BB) response within a 10 dB range (+3 to -7). When "70" is illuminated, the bottom scale is calibrated to indicate a response within a 73 dB range (+3 to 70) for NPR, Tone Search, of IF measurements.
LEVEL -dBm Digital Display	A four place digital display controlled by ZERO REF switch (A9S1) positions. Flashing decimals between displayed digits indicate an Out-of-Range measurement condition.
FREQUENCY -kHz Digital Display	A six place digital display indicating the frequency used for both Baseband (BB) and IF 70 MHz test modes. Flashing decimals between displayed digits indicate an Out-of-Range condition.
TUNING Controls: Large (Coarse) and Small (Fine) Verniers	Manual controls for frequency tuning of the internal Baseband Local Oscillator (BB LO) during MANUAL MODE testing. The resulting frequency is indicated by the FREQUENCY -kHz digital display. Both manual controls are overridden by the AUTO MODE test functions.

Table 3-1.
Model 4671 IF/Baseband Analyzer,
Controls and Indicators - continued

Control/Indicator	Function
MANUAL MODE Switch (A9S8)	A momentary switch, when depressed and released, simultaneously: 1. Illuminates MANUAL indicator, 2. Electronically cancels the AUTO MODE function (if previously selected), 3. Automatically switches to front panel controls for all test requirements and frequency tuning.
AUTO MODE Switch (A9S9)	A momentary switch, when depressed and released, simultaneously: 1. Illuminates AUTO indicator, 2. Electronically cancels the MANUAL MODE function (if previously selected), 3. Automatically switches to an internal plan of test sequences according to the measurement (BB or IF) required including the frequency scanning.
RECORD MODE Switch (A9S10)	A momentary switch, when depressed and released, simultaneously: 1. Illuminates RECORD indicator, 2. Initiates a pen down command to the Model 4673 X-Y Recorder, 3. Initiates an internal start signal for automatic scan operation. The next momentary operation of the switch cancels the listed functions. (NOTE: The RECORD MODE Switch may also be used in the manual mode to provide reference marks on the Model 4673 X-Y Recorder's plot.)
BB RESPONSE Switch (A9S2)	A momentary switch, when depressed and released: 1. Illuminates RESPONSE indicator, 2. Electronically changes the analog meter (A9M1) sensitivity to indicate between +3 and -7 dB (Top Scale), 3. Illuminates panel indicator "10" associated with the analog meter, 4. Automatically conditions the internal circuitry for baseband response testing.

Table 3-1.
Model 4671 IF/Baseband Analyzer,
Controls and Indicators - continued

Control/Indicator	Function
BB NPR Switch (A9S3)	A momentary switch, when depressed and released: 1. Illuminates NPR indicator, 2. Electronically changes the analog meter (A9M1) sensitivity to indicate between +3 and -70 dB (bottom scale), 3. Illuminates panel indicator "70" associated with the analog meter, 4. Automatically conditions the internal circuitry for noise power ratio testing by selecting the BW filter.
BB TONE SEARCH Switch (A9S4)	A momentary switch, when depressed and released, automatically: 1. Illuminates TONE SEARCH indicator, 2. Analog meter indicates between +3 and -70 dB (bottom scale), 3. Illuminates panel indicator "70" on right side of analog meter, 4. Selects the BW filter, 5. Automatically conditions internal circuitry for fluctuation noise and spurious tone testing.
NOTE: The following three switches are identical in function with exception to frequency. Switches A9S6 and A9S7 list only the differences.	
IF 70 MHz ±5 MHz Switch (A9S5)	A momentary switch, when depressed and released: 1. Illuminates ±5 MHz indicator, 2. Conditions analog meter (A9M1) to indicate between +3 and -70 dB (bottom scale), 3. Illuminates panel indicator "70" associated with the analog meter, 4. Selects the 30 kHz BW filter, 5. Conditions internal circuitry to scan between 65 and 75 MHz in the auto mode.

Table 3-1.
Model 4671 IF/Baseband Analyzer,
Controls and Indicators - continued

Control/Indicator	Function
IF 70 MHz ±25 MHz Switch (A9S6)	A momentary switch, when depressed and released: 1. Illuminates the ±25 MHz indicator, 2. Conditions internal circuitry to scan between 45 and 95 MHz in the auto mode.
IF 70 MHz ±35 MHz Switch (A9S7)	A momentary switch, when depressed and released: 1. Illuminates the ±35 MHz indicator, 2. Conditions internal circuitry to scan between 35 and 105 MHz in the auto mode.
REFERENCE Attenuators Units (0 to -10) switch (A9S3) Decades (0 to -40) switch (A9S4)	The two REFERENCE switches are operated in tandem to provide 0 to -50 dB attenuation for the operation of the 30 kHz IF reference amplifier.
INPUT Attenuators Units (0 to -10) switch (A9S1) Decades (-10/0/+10) switch (A9S2)	The two INPUT attenuators are operated in tandem to provide from +10 dB to -20 dB attenuation of the input signal. This is necessary to prevent an overload condition and provide realistic test measurements.
BASEBAND SCAN Switch 0.75, 1.5, 6.0, 12.5 MHz	Selects the full scale scan width in the automatic baseband modes. A choice of 0.75, 1.5, 6.0 and 12.5 MHz full scale is switch selectable.

Table 3-2.
Model 4673 X-Y Recorder,
Controls and Connectors

Front Panel Controls	Function
PEN RECORD/LIFT Switch	A two position slide switch that controls lowering and raising of the pen. The Model 4671 IF/Baseband Analyzer will override this switch when it is in the LIFT position.
SERVO ON/STANDBY Switch	A two position slide switch that controls the servo power for both axes.
CHART HOLD/RELEASE Switch	A two position slide switch that controls the paper chart holding function of the table.
LINE ON/OFF Switch	A two position slide switch that controls the application of line voltage to the Model 4673 X-Y Recorder.
Y ZERO Control	A variable adjustment of the pen position on the Y axis.
X ZERO Control	A variable adjustment of the pen position on the X axis.
Rear Panel Connectors	**Function**
Interface Connector J2	A 24 pin connector to provide interface with the Model 4671 IF/Baseband Analyzer through an S-A 148674 cable providing X-axis, Y-axis, and pen control functions.
LINE Connector J1	Ac power source receptacle which connects with the power cord provided.
FUSE ½AT/¼AT Line Fuse Holder	A line fuse holder to accommodate a 3AG 0.5A Slo-Blo fuse for 110V ac operation or a 3AG 0.25A Slo-Blo fuse for 220V operation.
LINE SELECTOR Switch	A four-position slide switch for 100, 115, 200, and 230 volt operation.

3.2.3 A summation of proper fuse ratings for components of the Model 4671 IF/Baseband Analyzer and associated components is provided in Table 3-3.

Table 3-3.
Proper Fuse Requirements

Component	AC Source	Fuse Rating
Model 4671 IF/Baseband Analyzer	110V	1.50 Amp, 3AG, Slo-Blo
	220V	0.75 Amp, 3AG, Slo-Blo
Model 4673 X-Y Recorder	110V	0.50 Amp, 3AG, Slo-Blo
	220V	0.25 Amp, 3AG, Slo-Blo
Model 4681 Cart	110V	15.0 Amp Resettable
	220V	Circuit Breaker

3.3 SYSTEM INTERCONNECTIONS

3.3.1 The Model 4671 IF/Baseband Analyzer is basically a receiver that can drive a recorder to generate permanent records. Figure 3-1 is a block diagram illustrating a back-to-back shelf test arrangement which can also be used as a quick GO/NO GO test of the system capabilities.

3.3.2 Initial Connections. The following connections are common to all test arrangements provided in this Chapter.

A. Check that all component ac power switches are OFF.
B. Connect the ac power cords from all components to the ac source. If possible, make sure that the third wire ac ground for all components operate from the same buss.

C. Connect the Model 4673 X-Y Recorder to the Model 4671 IF/Baseband Analyzer. (See Figure 3-2 for a sketch of the 148674 Interface Cable.)

1. Insert and secure the 24 pin connector on the 148674 Interface Cable to the Model 4673 X-Y Recorder interface connector (A1J1), which is accessible from the bottom and located to the left of the ac power cord connector.
2. Insert and secure the 14 pin connector on the 148674 Interface Cable to the RECORDER-J1 connector on the rear panel of Model 4671 IF/Baseband Analyzer.

3.3.3 Back-to-Back Self Test Connections (See Figure 3-1):

A. Connect the Model 4671 IF/Baseband Analyzer as described in 3.3.2.
B. Connect one end of a 75 ohm patch cord to the front panel XMTR OUT -75Ω jack on a Baseband Noise Transmitter.
C. Connect the opposite end of the patch cord to the front panel IF/BB IN connector on the Model 4671 IF/Baseband Analyzer.

NOTE: Control settings and Self Test procedures are provided after the connection listings.

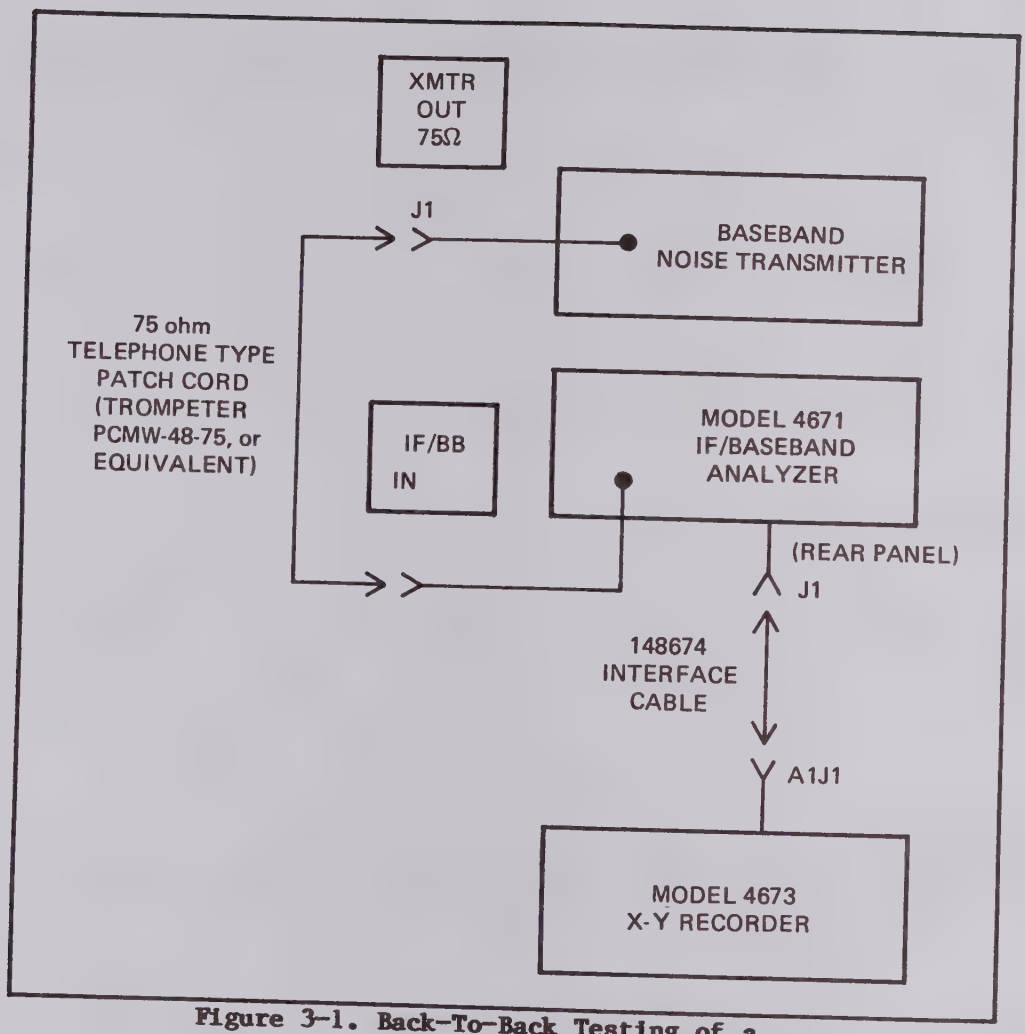

Figure 3-1. Back-To-Back Testing of a Model 4671 IF/Baseband Analyzer

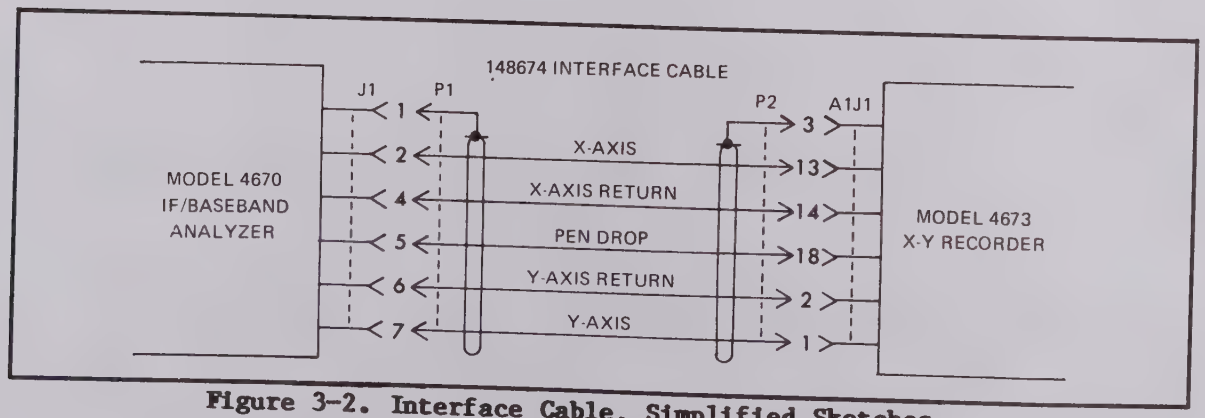

Figure 3-2. Interface Cable, Simplified Sketches

3.3.4 IF/Baseband Analyzer, 75 ohm Unbalanced Input (See Figure 3-3):

A. Connect the Model 4671 IF/Baseband Analyzer as directed in 3.3.2.
B. Connect one end of a 75 ohm patch cord to the front panel IF/BB IN -75Ω jack on the Model 4671 IF/Baseband.
C. Connect the opposite end of the patch cord to the 75 ohm unbalanced impedance output of a radio system under test.

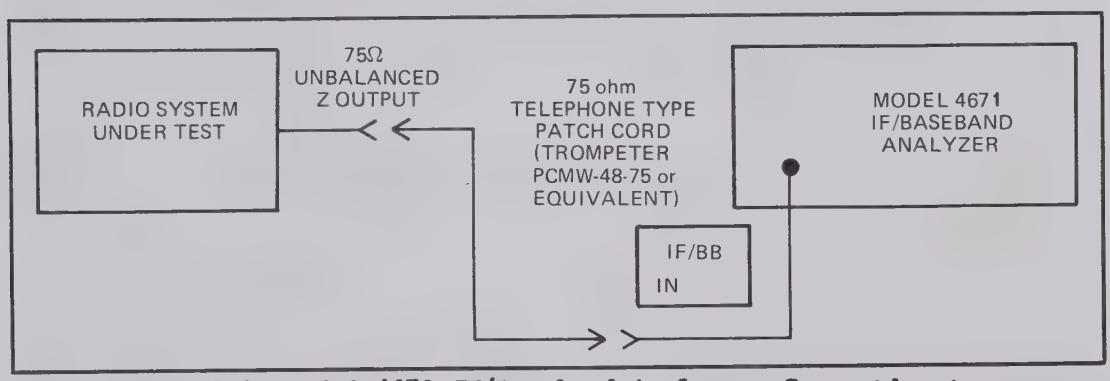
RADIO SYSTEM UNDER TEST
75Ω UNBALANCED Z OUTPUT
75 ohm TELEPHONE TYPE PATCH CORD (TROMPETER PCMW-48-75 or EQUIVALENT)
MODEL 4671 IF/BASEBAND ANALYZER
IF/BB IN

Figure 3-3. Model 4671 IF/Baseband Analyzer, Connection to Test a Radio System, Block Diagram

3.4 OPERATION

3.4.1 Before operating any controls, verify that all the proper cable connections have been made and are securely seated. If the Model 4671 IF/Baseband Analyzer has been transported to a different location, the back-to-back test should be performed to verify the initial operating status of the test equipment and provide the operator assurance that final test results will be valid.

3.4.2 Initi Initial Operation. Perform the listed steps in sequence whenever the Model 4671 IF/Baseband Analyzer is to be initially energized for a series of tests. After a back-to-back test shows the equipment is performing as required, the operator

need only to rearrange front panel control positions, and install the proper chart paper in the Model 4673 X-Y Recorder to advance from one selected test to another.

A. Operate the Baseband Noise Transmitter front panel POWER ON switch and observe the associated POWER ON indicator is illuminated.

B. Operate the Model 4671 IF/Baseband Analyzer front panel POWER ON switch and observe the various illuminated displays and controls.

C. Observe that the controls of the Model 4673 X-Y Recorder are positioned as follows:

   PEN RECORD/LIFT switch to LIFT
   SERVO ON/STANDBY switch to STANDBY
   CHART HOLD/RELEASE switch to RELEASE
   LINE ON/OFF switch to OFF
   Operate the LINE ON/OFF switch to ON.

D. Install a sheet of selected chart paper on the Model 4673 X-Y Recorder by placing the paper on the recording platen and align the left edge and bottom with the paper stops. Operate the CHART HOLD/RELEASE switch to HOLD.

E. If necessary, insert or replace the disposable pen which is pushed into the notched holder located on the carriage arm. It is secured to the holder by a twist-to-lock motion.

CAUTION

THE DISPOSABLE PEN INCORPORATES A PRECISION WRITING TIP. CARE MUST BE TAKEN NOT TO DAMAGE THIS TIP DURING PEN CHANGING OR OTHER HANDLING. WRITING BY HAND ON ANY SURFACE MAY DAMAGE THE PEN TIP. USE THE PEN ONLY IN THE PEN HOLDER ON THE RECORDER.

NOTE

A Universal pen holder is provided in the accessory kit which can be used with most fiber tip pens. The notched pen holder can be replaced with the Universal pen holder. A general fiber tip pen can then be installed and secured in place by pulling the locking ring up. Refer to the separate manual for more detailed information.

F. This completes the Initial Operation of the Model 4671 IF/Baseband Analyzer.

3.4.3 Back-to-Back Baseband Self Test. The following back-to-back test procedures enable the operator to verify the performance of the Model 4671 IF/Baseband Analyzer for baseband testing. A sheet of BASEBAND RESPONSE chart paper (also identified as CHART NO. 212 or CHART NO. 217 in the lower left corner) should be installed on the Model 4673 X-Y Recorder (refer to 3.4.2, Step D) for this test.

A. Interconnect the components associated with the Model 4671 IF/Baseband Analyzer as shown in Figure 3-1.

B. Position front panel controls of the Baseband Noise Transmitter to provide:

ATTENUATION: -10 dB

High Pass and low pass filters set for the desired channel loading and all Bandstop Filters switched out.

Noise Switch set to "ON".

C. Adjust the coarse and FINE TUNING controls of the Model 4671 IF/Baseband Analyzer until the digital FREQUENCY -kHz display indicates 1000.

INPUT: -10 dB

BB RESPONSE (Momentary switch); Depress and release

MODE-MANUAL (Momentary switch): Depress and release

REFERENCE: Adjust for 0 dBm on the top scale of the analog meter.

D. Adjust both X-ZERO and Y-ZERO controls on the Model 4673 X-Y Recorder for pen centering at 0 dBm (circled at the 0 dB and CAL grid intersection). Select the proper scan range.

E. Depress the MODE-AUTO momentary switch and release. Allow sufficient time for the recording pen to stabilize at the left margin of the chart paper.

F. Depress the MOD-RECORD switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the baseband amplitude response for the selected channel loading. After the test has been recorded, performance of the test can be verified by comparing the test chart with the Baseband Standard Chart shown in Figure 3-4.

3.4.4 Back-to-Back NPR (Noise Power Ratio) Testing. The following back-to-back test procedures enable the operator to verify the performance of the Model 4671 IF/Baseband Analyzer for NPR testing. A sheet of NPR & TONE SEARCH chart paper (also identified as CHART No. 213 or CHART NO. 218 in the lower left corner) should be installed on the Model 4673 X-Y Recorder (refer to 3.4.2, Step D) for this test.

A. Interconnect the components associated with the Model 4671 IF/Baseband Analyzer as shown in Figure 3-1.

B. Position front panel controls of the Baseband Noise Transmitter to provide: ATTENUATION: -10 dB

High Pass, Low pass and Bandstop Filters set for the desired channel loading.

Noise switch set to "ON"

NOTE: Do not run an NPR plot at 12.5 MHz scan width of 60 Hz high pass filter with a 70 kHz notch filter.

C. Adjust the coarse and FINE TUNING controls on the Model 4671 IF/Baseband Analyzer until the digital FREQUENCY -kHz display indicates 1000.

NPR (Momentary switch): Depress and release

MODE-MANUAL (Momentary switch): Depress and release

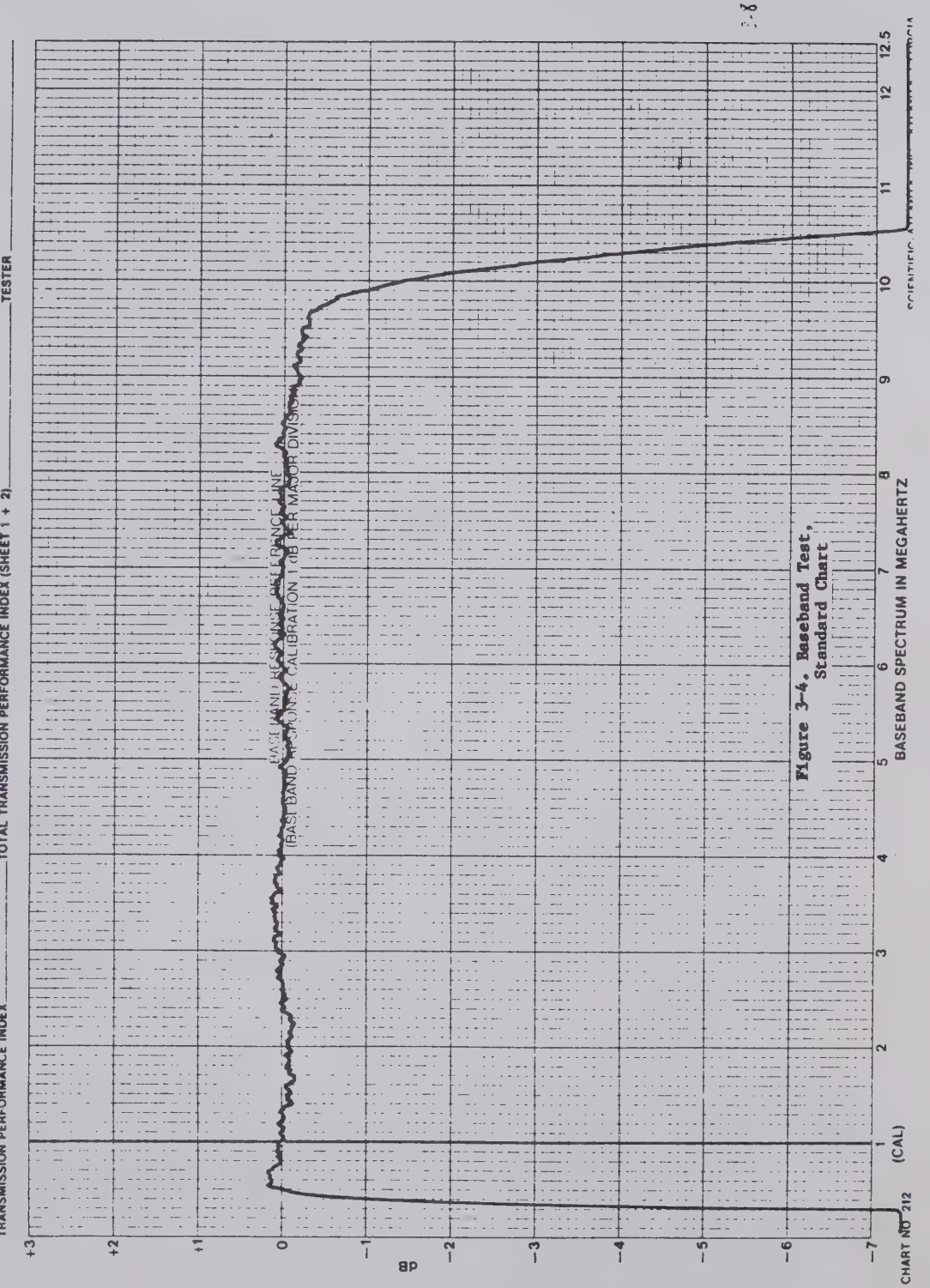

Figure 3-4. Baseband Test, Standard Chart

REFERENCE: Set to -33 dB
INPUT: Adjust for 0 dBm on the bottom scale of the analog meter.

D. Adjust both X-ZERO and Y-ZERO controls on the Model 4673 X-Y Recorder to center pen at the calibrate point (circled at the 71 and CAL grid intersection). Select the proper scan range.
E. Depress the MODE-AUTO momentary switch and release. Allow sufficient time for the recording pen to stabilize at the left margin of the chart paper.
F. Depress the MODE-RECORD switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the NPR response for the selected channel loading. After the test has been recorded, performance of the test can be verified by comparing the test chart with the NPR Standard Chart shown in Figure 3-5. During comparison, also note the appropriate slots at the selected bandstop frequencies.

3.4.5 Back-to-Back TONE SEARCH Testing. The following back-to-back test procedures enable the operator to verify the performance of the Model 4671 IF/Baseband Analyzer for TONE SEARCH testing. A sheet of NPR & TONE SEARCH chart paper (also identified as CHART NO. 213 or CHART NO. 218 in the lower left corner) should be installed on the Model 4673 X-Y Recorder (refer to 3.4.2, Step D) for this test.

A. Interconnect the components associated with the Model 4671 IF/Baseband Analyzer as shown in Figure 3-1.
B. Position front panel controls of the Baseband Noise Transmitter to provide:
ATTENUATION: -20 dB
High pass and low pass filters set for the desired channel loading, bandstop filters switched out.
Noise switch set to "OFF".

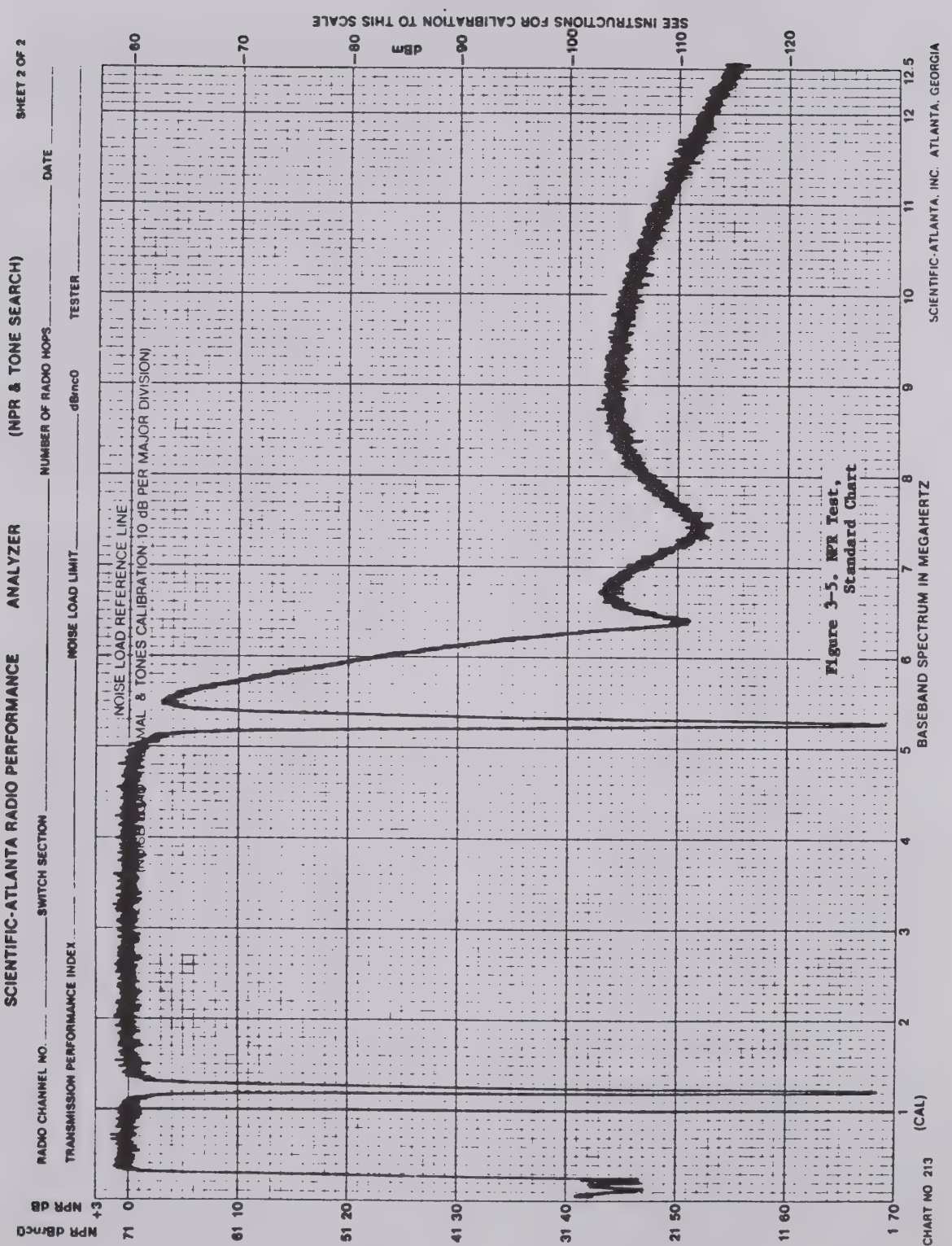
SCIENTIFIC-ATLANTA RADIO PERFORMANCE ANALYZER (NPR & TONE SEARCH)
SHEET 2 OF 2
RADIO CHANNEL NO. _____ SWITCH SECTION _____ NUMBER OF RADIO HOPS _____ DATE _____
TRANSMISSION PERFORMANCE INDEX _____ NOISE LOAD LIMIT _____ dBmc0 TESTER _____
NOISE LOAD REFERENCE LINE
(NOISE LOAD & TONES CALIBRATION 10 dB PER MAJOR DIVISION)
SEE INSTRUCTIONS FOR CALIBRATION TO THIS SCALE
NPR dBrnc0
NPR dB
dBm
BASEBAND SPECTRUM IN MEGAHERTZ
CHART NO 213 (CAL)
SCIENTIFIC-ATLANTA, INC. ATLANTA, GEORGIA

Figure 3-5. NPR Test, Standard Chart

C. Adjust the coarse and FINE TUNING controls on the Model 4671 IF/Baseband Analyzer until the digital FREQUENCY -kHz display indicates 1000.

   INPUT: -20 dB

   TONE SEARCH (Momentary switch): Depress and release

   REFERENCE: -50 dB

   MODE-MANUAL (Momentary switch): Depress and release

D. Adjust the X-ZERO control on the Model 4673 X-Y Recorder to center the pen at the 1 MHz grid line. Similarly, adjust the Y-ZERO control to center the pen at the grid line corresponding to the level indicated by LEVEL -dBm display, using the scale in the right margin. Select the proper scan range.

E. Depress the MODE-AUTO momentary switch and release. Allow sufficient time for the recording pen to stabilize at the left margin of the chart paper.

F. Depress the MODE-RECORD switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the TONE SEARCH response for the selected channel loading. After the test has been recorded, performance of the test can be verified by comparing the test chart with the TONE SEARCH standard chart shown in Figure 3-6.

3.4.6 Back-to-Back Baseband Self Tests for Other Channel Loading. If necessary, the tests specified in 3.4.3 through 3.4.5 can be repeated for any channel loading provided by the associated Baseband Noise Transmitter.

3.4.7 IF Self Test. The following test procedure enables the operator to verify the performance of the Model 4671 IF/Baseband Analyzer for IF testing. A sheet of IF TEST FORM chart paper (also identified as CHART NO. 214 in the lower left corner) should be installed on the Model 4673 X-Y Recorder (refer to 3.4.2, Step D) for this test.

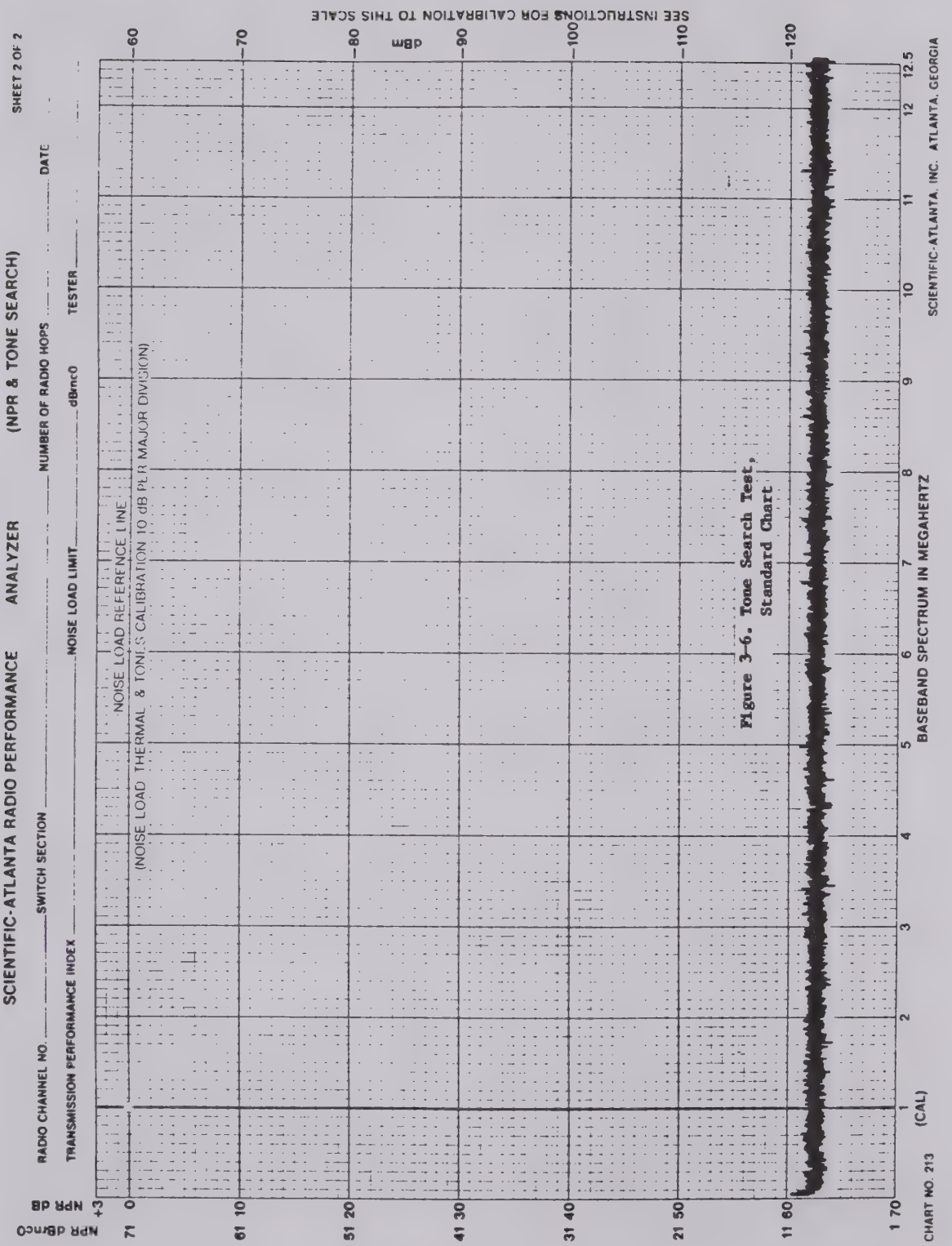

Figure 3-6. Tone Search Test, Standard Chart

A. Remove all connections from the front panel jack field only.

B Terminate the IF/BB IN input connector with a 75 ohm termination.

C. Position front panel controls as listed:

Model 4671 IF/Baseband Analyzer

INPUT: -20 dB

REFERENCE: -50 dB

±35 MHz (Momentary switch): Depress and release

MODE-MANUAL (Momentary switch): Depress and release

D. Adjust the coarse and FINE TUNING controls on the Model 4671 IF/Baseband Analyzer until the digital FREQUENCY kHz display indicates 70,000.

E. Adjust the X-ZERO control on the Model 4673 X-Y Recorder to center the pen over the 70 MHz line. Observe the LEVEL -dBm digital display for the proper calibration point. Adjust the Y-ZERO control to place the pen over a convenient X-axis grid and note the calibration point in the right-hand margin.

F. Depress AUTO-MODE momentary switch on the Model 4671 IF/Baseband Analyzer and release. Allow sufficient time for the recording pen to stabilize at the left margin of the chart paper.

G. Depress the MODE-RECORD switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the IF response between 35 and 105 MHz. After the test has been recorded, verify that there are no internally generated tones above -102 dBm and the thermal noise spectrum is less than -105 dBm.

3.4.8 Radio Testing

3.4.8.1 The step-by step instructions given in the preceding self-tests may also be used to verify the operation of a radio system under test. Important points to remember are:

A. Match the impedance of the test equipments to that of the radio system under test.

B. Adjust the output of the associated Baseband Noise Transmitter to properly match the input of the transmitter under test. Likewise, adjust the INPUT and REFERENCE attenuators on the Model 4671 IF/Baseband Analyzer to properly match the output of the receiver under test.

3.4.8.2 CROSS POLARIZATION DISTORTION (XPD) TESTING. Cross Polarization Distortion (XPD) testing indicates the quality signal polarization and the amount of adjacent channel signal energy appearing in the channel under test. Basically, the amount of XPD is dependent upon the characteristics of the antenna and the waveguide. For the following procedure, a sheet of IF TEST FORM chart paper (also identified as CHART NO. 214 in the lower left corner) should be installed on the Model 4673 X-Y Recorder (refer to 3.4.2, Step D).

A. At the distant end, terminate the input of the FM transmitter associated with the desired polarization plane (either vertical or horizontal).

B. At the near end, connect the output of the IF preamplifier associated with the same polarization plane to the IF/BB IN input connector on the Model 4671 IF/BB Analyzer as shown in Figure 3-7.

C. Position front panel controls as listed:

Model 4671 IF/BB Analyzer

INPUT: As required to match the output of the IF preamplifier, typically +10 dB.

70 ±35 MHz (Momentary switch): Depress and release

MODE-MANUAL (Momentary switch): Depress and release

D. Adjust the coarse and FINE TUNING controls to obtain a signal peak on the carrier frequency. Use the analog meter for adjusting for the peak. (Since the measurement filter bandwidth is 30 kHz, it will be necessary to recheck the carrier peak during calibration).

E. Adjust the REFERENCE attenuator for a 0 dB reading on the (+3/-70) scale on the analog meter.
F. Adjust the X-ZERO and Y-ZERO controls on the Model 4673 X-Y Recorder to place the pen over the correct carrier frequency and 0 dB cross-hatch. Again verify the carrier peak.
G. Depress the MODE-AUTO momentary switch on the Model 4671 IF/Baseband Analyzer and release. Allow sufficient time for the recording pen to stabilize at the left margin of the chart paper.
H. Depress the MODE-RECORD momentary switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the XPD test showing the amplitude of the carrier relative to the cross-polarized signals.
I. Repeat the test for the opposite polarization.

3.4.8.3 CARRIER-TO-INTERFERENCE (C/I) RATIO TESTING. Co-channel interference results when the receiving antenna picks up another radio site transmitting on the same frequency. To properly measure the interfering signal, the frequency of the radio under test must be shifted enough to allow observation of the channel center frequency. A Scientific-Atlanta Model 4682 IF/Baseband Test Oscillator may be used to shift the frequency of the radio under test. For the following procedure a sheet of IF TEST FORM chart paper (also identified as CHART NO. 214 in the lower left corner) should be installed on the Model 4673 X-Y Recorder (refer to 3.4.2, Step D).

A. Connect the test equipment as shown in Figure 3-8.
B. Position front panel controls as listed.

Model 4671 IF/BB Analyzer

INPUT: As required to match the output of the IF preamplifier, typically +10 dB.
70 ±35 MHz (Momentary switch): Depress and release
MODE-MANUAL (Momentary switch): Depress and release

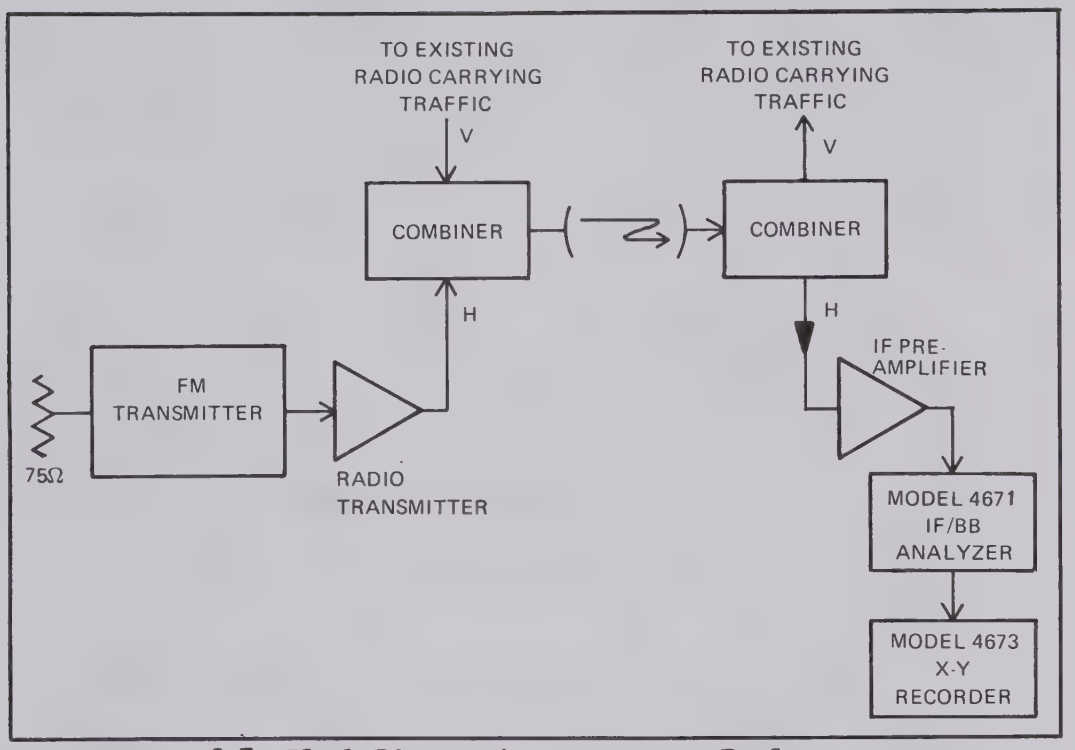

Figure 3-7. Block Diagram Arrangement to Perform Cross Polarization Distortion (XPD) Testing

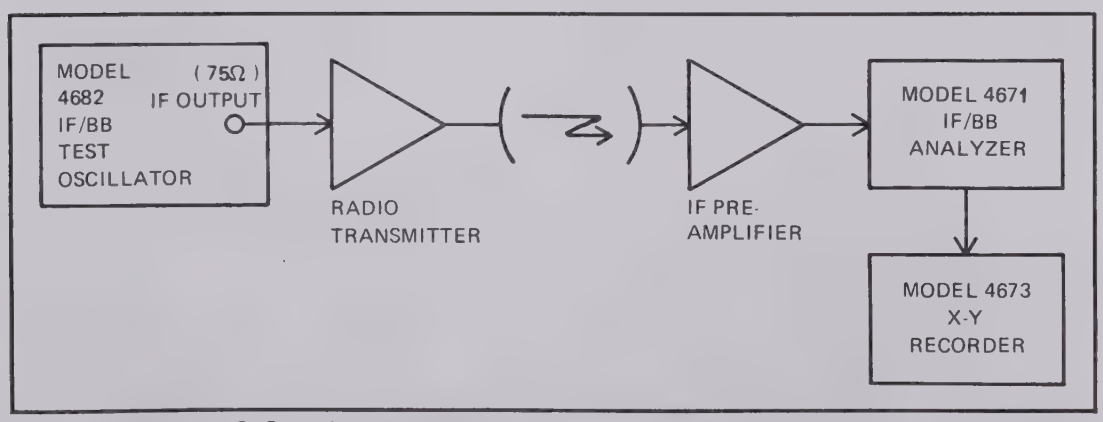

Figure 3-8. Block Diagram Arrangement to Perform Carrier-to-Interference (C/I) Ratio Testing

Model 4682 IF/Baseband Test Oscillator (Numbers in parentheses refer to the 74 MHz version only).

LEVEL: As required to match the input of the radio transmitter.

FREQ MHz: 0.3 MHz above channel center frequency or 70.3 MHz (74.3 MHz)

C. Adjust the coarse and FINE TUNING controls to obtain a signal peak on the test frequencies 70.3 MHz (74.3 MHz). Use the analog meter for adjusting for the peak. (Since the measurement filter bandwidth is 30 kHz, it will be necessary to recheck the carrier peak during calibration.)

D. Adjust the REFERENCE attenuator for a 0 dB reading on the (+3/-70) scale on the analog meter.

E. Adjust the X-ZERO and Y-ZERO controls on the Model 4673 X-Y Recorder to place the pen over the correct test frequency, 70.3 MHz (74.3 MHz), and 0 dB crosshatch. Again verify the test frequency peak.

F. Depress the AUTO-MODE momentary switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the C/I test showing the amplitude of the interfering signal relative to the carrier test frequency.

3.4.8.4 MODULATION DEVIATION ADJUSTMENT (Bessel-Null). The Model 4671 IF/Baseband Analyzer, along with the Model 4682 IF/Baseband Test Oscillator, may be used to accurately set an FM transmitter's frequency deviation according to the following procedure:

A. Connect the test equipment as shown in Figure 3-9.

B. Adjust the FM transmitter's frequency deviation to a minimum.

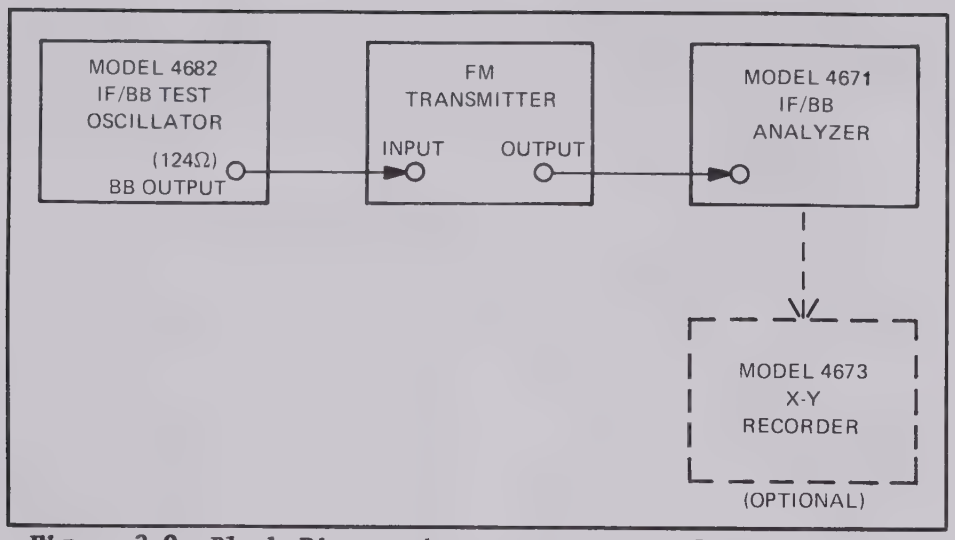

Figure 3-9. Block Diagram Arrangement to Perform Modulation Sensitivity Adjustment (Bessel-null).

C. Position front panel controls as listed:

Model 4682 IF/Baseband Test Oscillator.

The baseband output is preset and requires no setting of the front panel controls.

INPUT: As required to match the output of the FM transmitter. Additional external attenuators may be necessary if an overload condition is experienced.

70 ±5 MHz (Momentary switch): Depress and release

MODE-MANUAL (Momentary switch): Depress and release

D. Adjust the coarse and FINE TUNING controls to obtain a signal peak on the carrier frequency. Use the analog meter for adjusting for the peak.

E. Adjust the REFERENCE attenuator for a 0 dB reading on the (+3/-70) scale on the analog meter.

F. Slowly increase the FM transmitter's frequency deviation control until the first null (or dip) on the analog meter is observed. Carefully adjust the deviation control until the null is at its lowest value. The modulator sensitivity will now be set at 4.0 MHz PEAK/-12 dBm.

G. If a permanent copy of the FM transmitter's output spectrum is desired, place a sheet of IF TEST FORM chart paper (also identified as CHART NO. 214 in the lower left corner) on the platen of the Model 4673 X-Y Recorder (refer to 3.4.2, Step D).

H. Adjust the X-ZERO and Y-ZERO controls on the Model 4673 X-Y Recorder to place the pen over the correct carrier frequency grid line (X-ZERO) and over the grid line which corresponds to the digital LEVEL -dBm display (Y-ZERO).

I. Depress MODE-AUTO momentary switch on the Model 4671 IF/Baseband Analyzer and release. Allow sufficient time for the recording pen to stabilize at the left hand margin of the chart paper.

J. Depress MODE-RECORD momentary switch and release. Observe that the Model 4673 X-Y Recorder automatically scans and plots the FM transmitter's output spectrum, verifying the Bessel-Null modulator sensitivity adjustment.

CHAPTER 4
THEORY OF OPERATION

4.1 GENERAL

4.1.1 Each part of the theory of operation for the Model 4671 IF/Baseband Analyzer is started with a block diagram analysis of the equipment to be covered. Simplified circuit diagrams are included where possible to provide a better understanding of circuit operation. Also, each part of the theory of operation is presented according to signal flow regardless of any circuit layout designation. The diagrams provided in Chapter 7 are arranged in alphanumeric sequence without regard to signal flow.

4.2 MODEL 4671 IF/BASEBAND ANALYZER, BLOCK DIAGRAM ANALYSIS

4.2.1 Signal Input. A block diagram of the Model 4671 IF/Baseband Analyzer is shown in Figure 4-1 and component locations are shown in Figure 4-2. The main signal input is the front panel IF/BB IN connector (A9S6). Interchangeable BNC adapter connectors provide compatible terminations for either large and small WECo connectors or large and small Siemens connectors.

4.2.2 Input signals to the IF/BB IN jack (A9J6) can be at either Baseband or IF frequencies. The input signal is connected directly into the 0 to 30 dB Input Attenuator which is remotely operated by the binary code generated by the two front panel INPUT switches (A9S1 and A9S2). A SPDT relay in the Input Attenuator switches the attenuated input signal to either the IF Converter (A4) circuits for the Baseband Converter (A5) circuits depending on the test mode selected.

4.2.3 IF Mode Testing. When testing in the IF Mode, the 35 to 105 MHz input signal is applied to a 110 MHz low-pass filter. This filter input is monitored by an FET overload detector. The output signal from the low-pass filter is first amplified and then mixed with a 185 to 255 MHz signal from the IF LO (A3) module circuit to produce a 150 MHz IF signal for a 70 MHz input signal. The 150 MHz signal is then applied to a bandpass filter having a bandwidth of 5 MHz. This filter rejects both the IF LO frequency and the upper sideband of the mixer output signal. Output signals from the bandpass filter are then mixed with a 120 MHz crystal controlled oscillator signal to produce a 30 MHz signal which is routed to the Baseband Converter (A3) module circuit.

4.2.4 Baseband Mode Testing. When testing in the Baseband Mode, the 10 kHz to 12.5 MHz input signal through the Input Attenuator is applied to a 14 kHz low pass filter in the Baseband Converter (A5). This filter input is monitored by a FET overload detector. The low pass filter output signal is then mixed with a 30 to 42.5 MHz signal from the Baseband LO (A13) module circuit and produces a 30 MHz Baseband frequency. This 30 MHz signal is amplified and provided to a relay contact which operates under control of the front panel MODE switches and permits selection between the 30 MHz IF Mode signal and the 30 MHz Baseband Mode signal. Either selected signal will be processed and analyzed identically through the following circuits.

4.2.5 Signal Processing and Analyzing. The selected 30 MHz signal is applied to a 30 MHz crystal filter which rejects undesired LO mixer signal. The filtered 30 MHz signal is then amplified and applied to a mixer together with a 29.6597 MHz crystal oscillator signal to produce a 302.727 kHz output signal. This signal is applied to a 302.7 kHz bandpass filter in the 302 kHz IF Module (A6) which has a 30 kHz bandwidth, and is used to determine the power measuring bandwidth in all IF test modes and the Baseband Response test mode. After filtering, the signal is

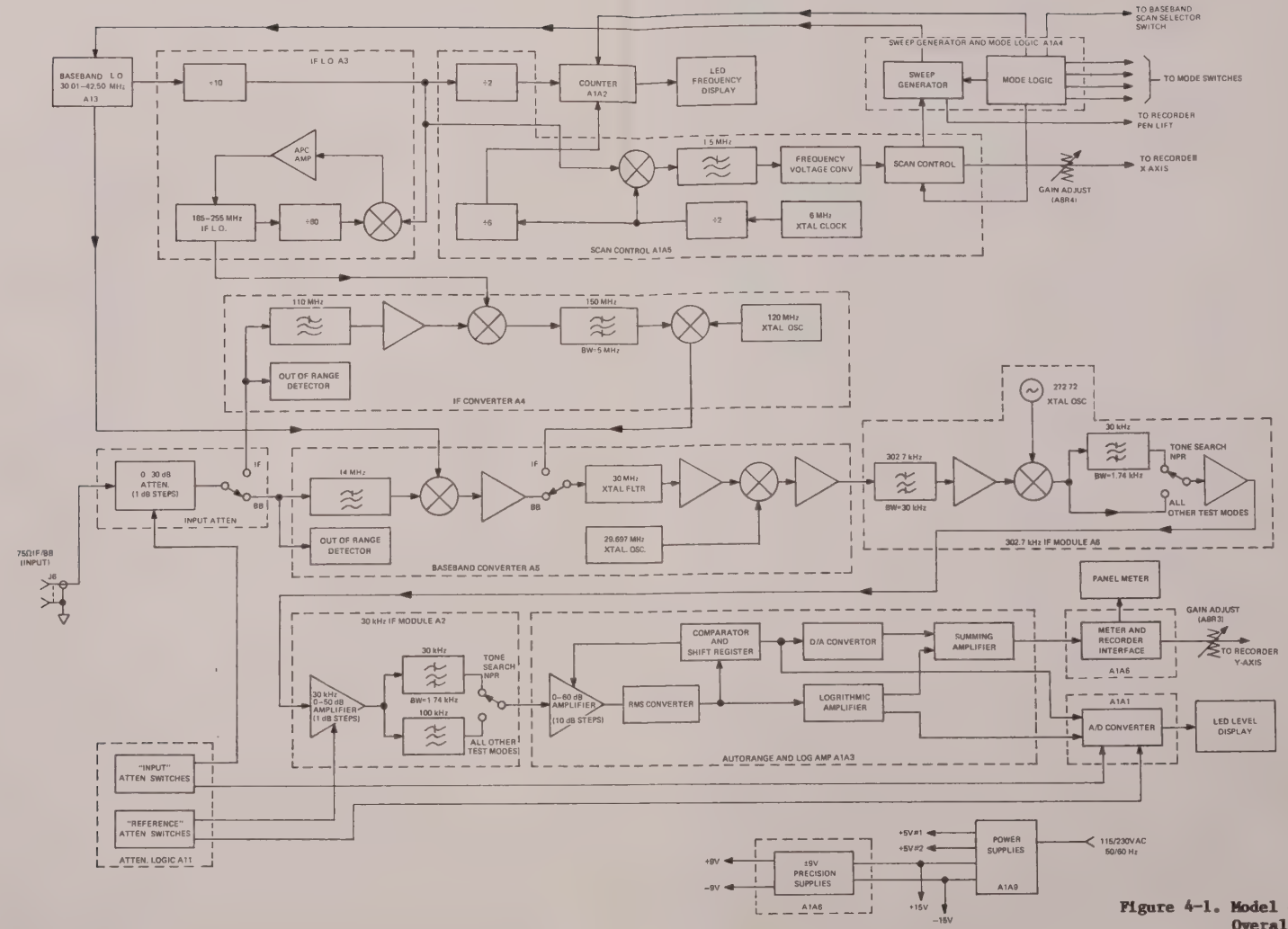

Figure 4-1. Model 4671 IF/Baseband Analyzer, Overall Block Diagram

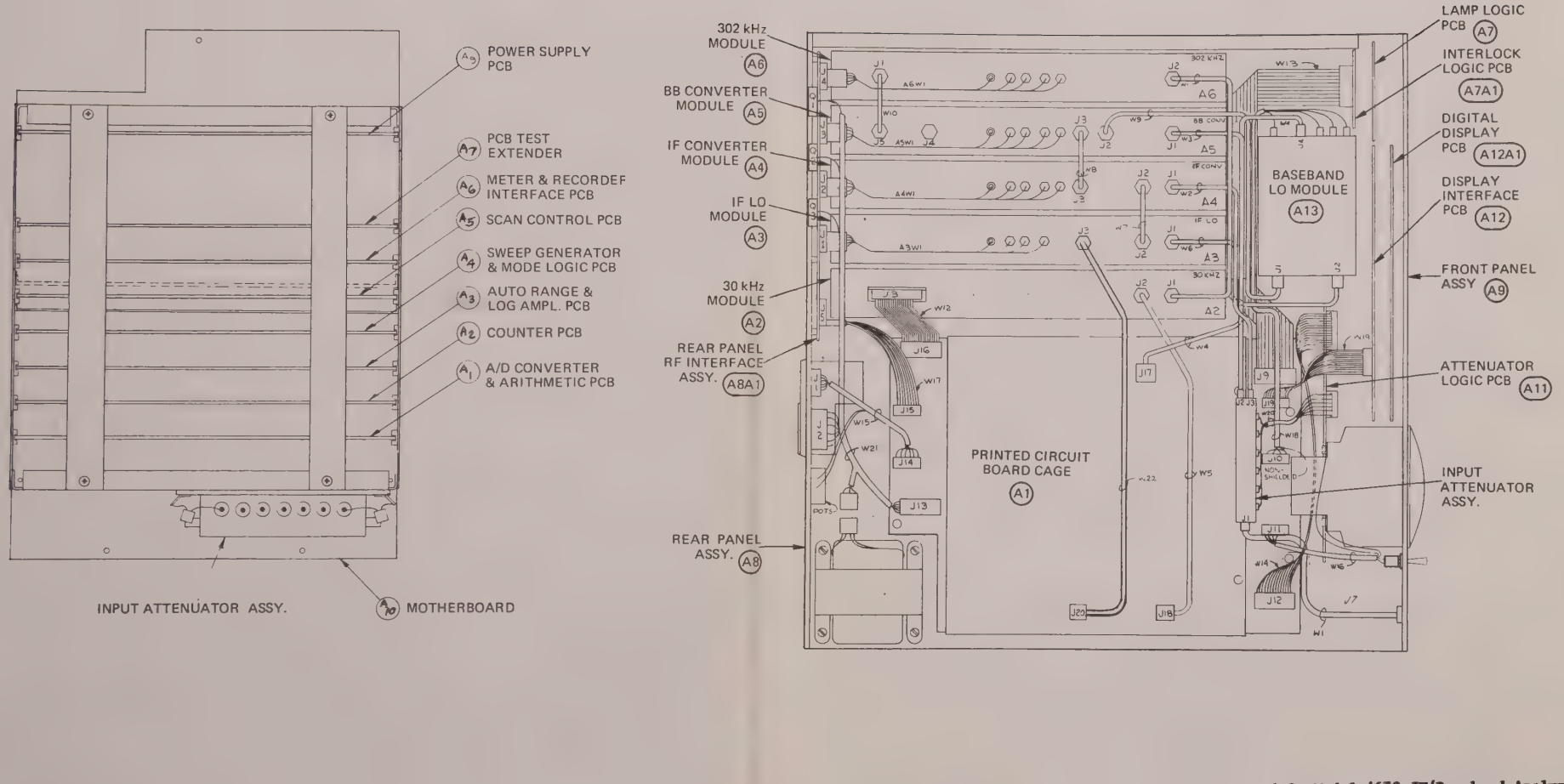
A9 POWER SUPPLY PCB
A7 PCB TEST EXTENDER
A6 METER & RECORDER INTERFACE PCB
A5 SCAN CONTROL PCB
A4 SWEEP GENERATOR & MODE LOGIC PCB
A3 AUTO RANGE & LOG AMPL. PCB
A2 COUNTER PCB
A1 A/D CONVERTER & ARITHMETIC PCB
INPUT ATTENUATOR ASSY.
A10 MOTHERBOARD
302 kHz MODULE A6
BB CONVERTER MODULE A5
IF CONVERTER MODULE A4
IF LO MODULE A3
30 kHz MODULE A2
REAR PANEL RF INTERFACE ASSY. A8A1
REAR PANEL ASSY. A8
PRINTED CIRCUIT BOARD CAGE A1
BASEBAND LO MODULE A13
LAMP LOGIC PCB A7
INTERLOCK LOGIC PCB A7A1
DIGITAL DISPLAY PCB A12A1
DISPLAY INTERFACE PCB A12
FRONT PANEL ASSY A9
ATTENUATOR LOGIC PCB A11
INPUT ATTENUATOR ASSY.

Figure 4-2. Model 4670 IF/Baseband Analyzer, Component Location

amplified to compensate for the filters insertion loss and applied to a mixer together with a 272.727 kHz crystal oscillator signal to produce a 30 kHz output signal. The 30 kHz output signal is applied either directly or indirectly through a 30 kHz filter to a buffer amplifier through an electronic switch. The 30 kHz bandpass filter has a bandwidth of 1.74 kHz which conditions the signal to be used in the NPR and Tone Search test modes. The electronic switch is controlled by the front panel test mode switches.

4.2.6 30 kHz IF Module (A2). The buffered 30 kHz signal is then applied to the first amplifier in the 30 kHz IF Module (A2). This amplifier's gain is front panel controlled by the REFERENCE switches (A9S3 and A9S4) through a 0 to 50 dB range which is adjustable in 1.0 dB steps. The output signal of this gain regulated amplifier is applied to the inputs of both a 30 kHz bandpass filter and a 100 kHz low pass filter. The proper filter is connected into the circuit by an electronic switch which is controlled by front panel test mode switches.

4.2.7 Auto Range and Log Amplifier Printed Circuit Board (A1A3). An output signal from the 30 kHz IF Module (A2) is first applied to a 0 to 60 dB amplifier whose gain can be switched in 10 dB steps to provide the proper level to drive a RMS Converter circuit. This circuit is a true RMS Converter and provides a range correcting signal return through a comparator and shift register to the 0 - 60 dB amplifier so the RMS Converter circuit need only to operate over a 10 dB range instead of from 0 to 60 dB. The RMS Converter output signal is applied to the Logarithmic Amplifier circuit and by using the relatively small 10 dB range limitation accuracy is proportionally increased. A second output signal from the Comparator and Shift Register circuit is applied to an Analog-to-Digital Converter circuit (A1A1) together with the Logarithmic Amplifier output signal. The two signals are summed to provide a signal proportional to the logarithm representing the true RMS signal applied to the Auto range amplifier circuit.

4.2.8 Meter and Recorder Interface Printed Circuit Board (A1A6). Output signals from the Comparator and Shift Register circuit on A1A3 are also applied to a Digital-to-Analog Converter circuit whose output signal is applied to a Summing Amplifier together with a second output signal from the Logarithmic Amplifier. The summation of the two signals provide an output signal which is applied to the Meter and Recorder Interface circuit (A1A6). The Meter and Recorder Interface circuit properly conditions the input signal by varying the response time to reflect the selected test mode. This conditioning is necessary for the Model 4673 X-Y Recorder to accurately plot the peak value of rapidly varying signals. The conditioned output signals are applied to the Model 4673 X-Y Recorder through the rear panel Y-AXIS GAIN adjust control (A8R3) and output connector A8J1, pins 6 and 7. These signals are also displayed on the front panel analog meter (A9M1). When the system is in the NPR-Mode and Data is being recorded a rate-of-change detector circuit is activated. If the data to be recorded is changing faster than the maximum slew speed of the recorder, signals are sent to the Sweep Generator and Mode Logic Board causing the frequency sweep to be decreased.

4.2.9 Front Panel Digital Display (A12A1). The RMS input signal value is a summation of signals from both the Shift Register circuit and the Logarithmic Amplifier circuit from the Auto Range and Log Amplifier printed circuit board (A1A3) as described in 4.2.7. This signal is applied to a microprocessor together with logic levels representing the positions of the front panel INPUT switches and REFERENCE switches. The microprocessor output signal represents the absolute value of the input signal in dB which is directly applied to the front panel LED Level Display (A12A1).

4.2.10 Baseband LO (A13). The Baseband local oscillator (LO) module (A13) is a stable LC oscillator that can be operated either manually using front panel controls or automatically through the sweep circuitry in the AUTO SCAN Mode. The Baseband LO (A13) serves as a reference for both frequency measurement generation and the front panel frequency display. One of the two Baseband LO (A13) output signals is applied directly to a mixer stage in the Baseband Converter (A5) circuit to upconvert the baseband frequency spectrum to 30 MHz. The second output signal is divided by a factor of 10 and used as a reference for the IF LO module (A3).

4.2.11 IF LO Module (A3). The IF local oscillator (LO) module (A3) is a 185 to 255 MHz voltage controlled oscillator (VCO). The VCO output signal is divided by 60 and applied to a mixer together with the Baseband LO (A13) reference signal. The mixer produces a signal which is proportional to the phase error between the two applied input signals which in turn is amplified and filtered by the Automatic Phase Control (APC) Amplifier circuit. An output voltage from the APC Amplifier is applied to the VCO to change the frequency in the proper direction necessary to reduce the error voltage to zero. The fundamental VCO output signal of the IF LO (A3) is applied to a mixer in the IF Converter (A4) module for upconverting the 45 to 105 MHz IF input signal to a 150 MHz IF signal.

4.2.12 Scan Control Printed Circuit Board (A1A5). The Scan Control printed circuit board (A1A5) has two main functions. The first function consists of generating various gating and local oscillator signals. A 6 MHz crystal oscillator provides the master clock reference whose output signal is divided by 12 to provide 500 kHz which is used by the digital counter printed circuit board (A1A2) for various timing and gating functions. The second function of the Scan Control printed circuit board (A1A5) is to generate a voltage proportional to the Baseband LO (A13) frequency. This voltage is conditioned to both properly

drive the Sweep Generator circuits on the Mode Logic and Sweep Generator printed circuit board (A14) and drive the X-axis of the Model 4673 X-Y Recorder through the rear panel X-AXIS GAIN adjust control (A8R4) and output connector A8J1, pins 2 and 4. To generate the Baseband LO equivalent voltage, the Baseband LO module (A13) output signal is first divided by 10 in the IF LO module (A3). The resulting signal is coupled to a mixer port on the Scan Control printed circuit board (A1A5). A second mixer input signal is provided by dividing the Scan Control 6 MHz master clock by 2 for a 3 MHz signal. The mixer output signal is applied through a 1.5 MHz low pass filter (to reject the upper sideband) to a Frequency-to-Voltage Conversion circuit whose dc output voltage is directly proportional to the BB LO module (A3) output frequency. The dc output voltage is applied to a Scan Control summing amplifier whose offset and gain are determined by the test mode selected. In this manner, the Sweep Generator circuit output and the X-AXIS signal to the Model 4673 X-Y Recorder direct the recorder to start at the proper point and provide a full length sweep of the chart regardless of the test mode selected.

4.2.13 Mode Logic and Sweep Generator Printed Circuit Board (A1A4). Most of the Sweep Generator circuit functions have been described under the Scan Control printed circuit board (A1A5) functions in 4.2.12. The function of the Mode logic circuit is to interpret the position of the front panel test mode switches and select the proper filter bandwidths, sweep and retrace time, scan frequencies, scan widths, and signal conditioning. Forward sweep time is nominally 45 seconds except for the 70(±35) MHz and the TONE SEARCH test modes. The forward sweep time for the 70(±35) MHz test mode is approximately 70 seconds, and approximately 180 seconds for the Tone Search test mode. An automatic slow scan circuit is activated in the NPR mode to accurately follow the depth of the narrow notch. Retrace time for all Baseband test modes is as rapid as the Model 4673 X-Y Recorder can slew back to the starting point. Retrace time for the IF test modes is intentionally slowed so the phase lock loop of the IF LO module (A3)

will not lose lock during retrace. The Sweep Generator circuit also generates a ramp signal which is summed with the proportional dc voltage (representing the BB LO frequency) which was generated on the Scan Control printed circuit board (A1A5). This composite sweep signal is returned to the BB LO module (A13) to sweep over the desired frequency range as determined by the test mode switches. When the circuits are automatically scanning, the front panel FREQUENCY - kHz controls are disconnected from the BB LO module (A13). When the signals derived on the Meter and Recorder Interface board are activated, the following action takes place due to the circuitry on this board:

1. The pen is lifted.
2. The frequency sweep is reversed causing the pen carriage to back up.
3. The pen is returned to the paper.
4. The frequency sweep again moves forward but at a slower rate for some predetermined period of time.
5. The frequency sweep then returns to its normal sweep speed.

This procedure allows data to be recorded and not take an extremely long time to record. The system slows down only when needed to allow for the limited neutral slew speed of the recorder.

4.2.14 Power Supply Printed Circuit Board (A1A9). The Power Supply printed circuit board (A1A9) operates from a dual primary transformer which provides for normal operation from either 110 or 220 volts ac input at 50 to 60 Hz. One secondary voltage is provided from a center-tapped winding to a diode bridge. The center-tap permits the diode arrangement to operate as two separate fullwave rectifiers to provide both +15V (raw) dc and -15V (raw) dc. These two sources are applied through separate fuses to a dual tracking regulator which in turn drives series pass transistors (A8Q1 and A8Q2) mounted on the rear panel. The dual tracking regulator will also provide over current protection

by automatically shutting down if current requirements are exceeded. The second secondary ac input voltage is applied across a second diode bridge rectifier to provide the raw +5V dc supply. The raw +5V dc supply is then split to provide two +5V dc sources. One source is provided through a three terminal regulator (A8U1) mounted on the rear panel for the requirements of the front panel, the Counter printed circuit board (A1A2), and the A/D Converter and Arithmetic printed circuit board (A1A1). The second source is provided through a three terminal regulator on the Power Supply printed circuit board (A1A9) for the remaining +5V dc requirements of the Model 4671 IF/Baseband Analyzer circuits. Both +5V dc regulators have internal thermal protection against over current conditions and all supplies are provided with hybrid crowbar circuit protection for over voltage conditions. Each hybrid crowbar has been selected to fire when the supply voltage exceeds approximately 120% of nominal value.

4.3 MODEL 4671 IF/BASEBAND ANALYZER, MODULE, AND PRINTED CIRCUIT BOARD ANALYSIS

4.3.1 Input Attenuator. The purpose of the Input Attenuator is to attenuate applied input signals greater than -20 dBm to prevent overloading either the IF Converter module (A4) or Baseband Converter module (A5). The Input Attenuator operates from dc to 105 MHz and provides up to 30 dB attenuation in 1 dB steps.

4.3.1.1 The Input Attenuator is made up of a five-bit binary network with attenuator pads of 1 dB through 16 dB. Each pad is controlled by the Attenuator Logic printed circuit board (A11) which provides the necessary decimal-to-binary decoding.

4.3.1.2 The front panel IF/BB IN connector (A9J6) connects to input connector J1 on the Input Attenuator. Output signals are provided through J2 to the IF Converter module (A4) or through J3 to the Baseband Converter module (A5).

4.3.2 Attenuator Logic Printed Circuit Board (A11). A block diagram of the front panel Attenuator Logic printed circuit board (A11) is shown in Figure 4-3. The Attenuator Logic circuits interface between the programmable Input Attenuator and the front panel INPUT and REFERENCE switches (A9S1 through A9S4). The various positions of the INPUT switches are encoded from decimal to binary and various positions of the REFERENCE switches are encoded from decimal to BCD. Encoded REFERENCE switch information is also used to properly adjust the programmable reference amplifier in the 30 kHz IF module (A2). The encoded switch positions are summed to provide both 5-bit binary and 7-bit BCD positive true logic outputs to interface with the A/D Converter and Arithmetic printed circuit board (A1A1). Transistors A11Q1 through A11Q5 are relay drivers to select the binary steps of the Input Attenuator and assure the proper signal level for normal operation.

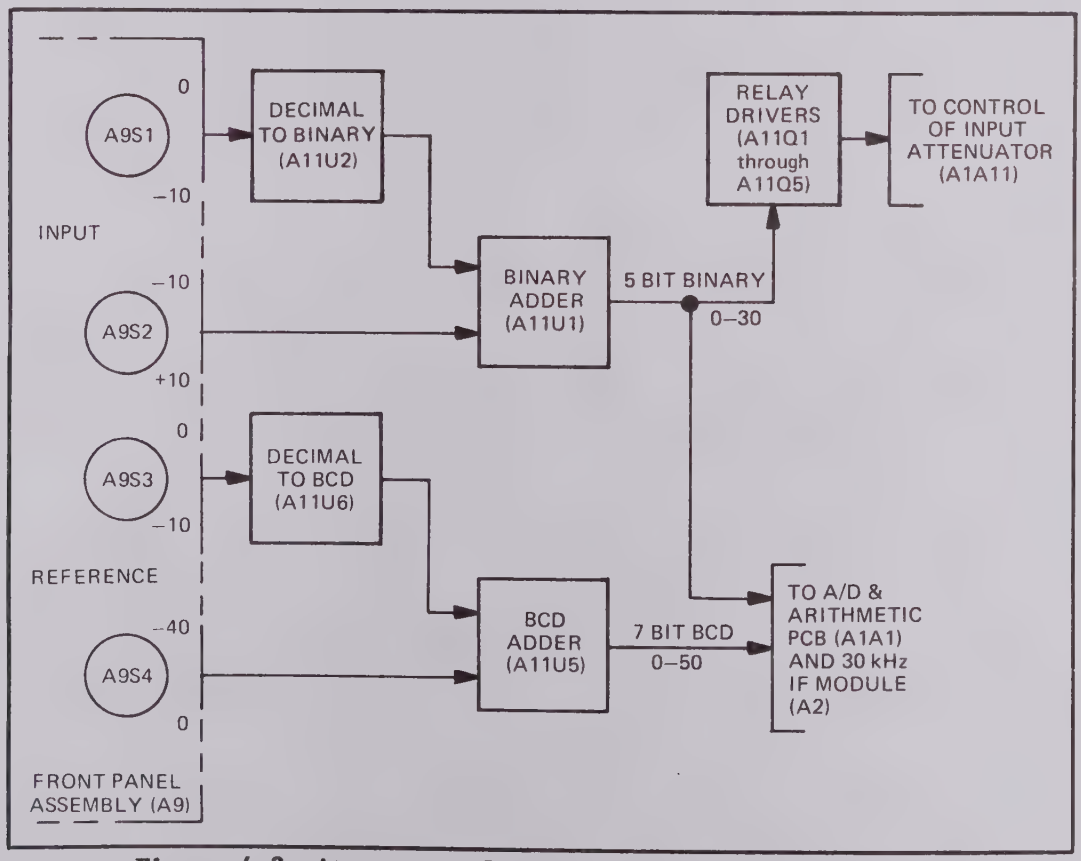

Figure 4-3. Attenuator Logic Printed Circuit Board (A11), Block Diagram

4.3.3 Baseband Local Oscillator Module (A13). A block diagram of the Baseband Local Oscillator module (A13) is shown in Figure 4-4. The Baseband Local Oscillator provides the signal required by the Baseband Converter module (A5) to convert a baseband signal between 10 kHz and 12.5 MHz up to a 30 MHz IF signal. The Baseband Local Oscillator also serves as a reference for the phase-locked loop in the IF Local Oscillator Module (A3). A variable capacitor (C38) and the front panel FINE TUNING control (A9R33) provide the manual tuning of the Baseband Local Oscillator.

4.3.3.1 When the Model 4671 IF/Baseband Analyzer is operated in the MANUAL MODE, a tank circuit using inductor L5 and variable capacitor (C38) is connected to the oscillator circuit (transistors Q3 and Q4) through normally closed contacts of de-energized relay K1. Fine frequency adjustments are provided through the arrangement of front panel FINE TUNING control (A9R33) and inductor L4. The frequency range of the Baseband Local Oscillator when operating in the MANUAL mode varies from 30.01 MHz to 42.50 MHz which corresponds to baseband signals of 10 kHz to 12.5 MHz.

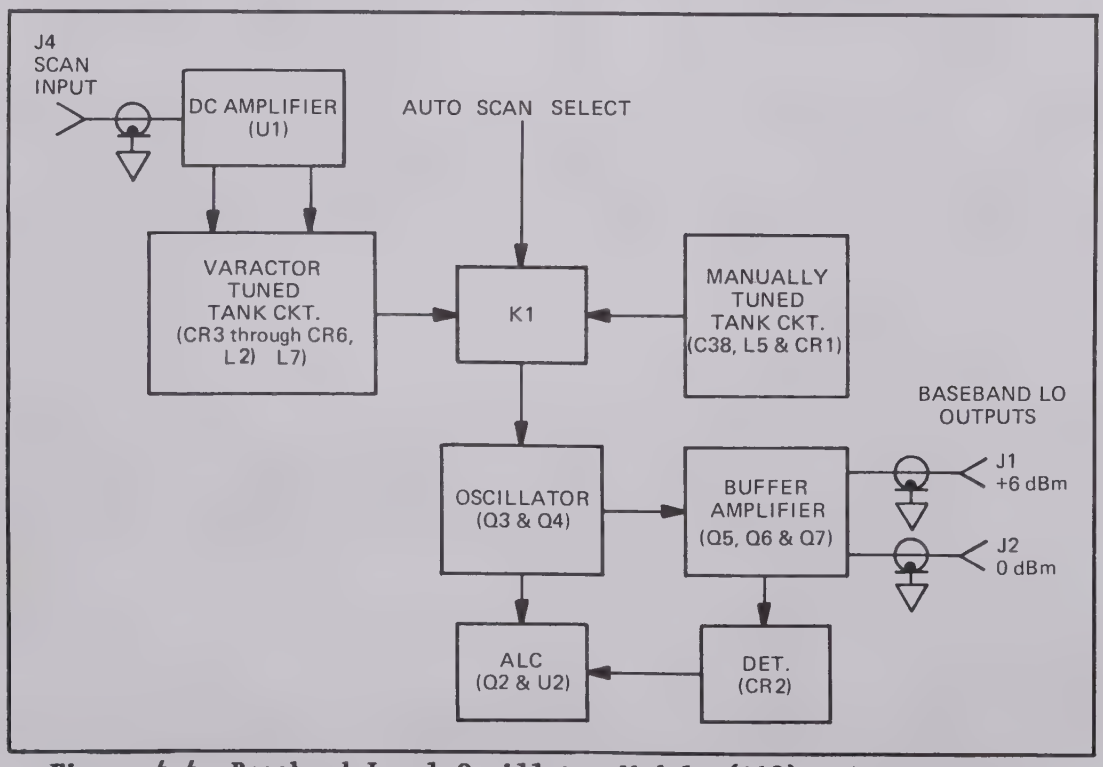

Figure 4-4. Baseband Local Oscillator Module (A13), Block Diagram

4.3.3.2 When operating in the AUTO Mode, transistor Q1 is enabled, and in turn, energizes relay K1. The energized relay contacts disconnect the manual tuning function and connect a tank circuit using inductors L2, L6, and L7 with varactor diodes CR3 through CR6 to the oscillator. The scan input signal from the Sweep Generator and Mode Logic printed circuit board (A1A4) is applied to connector J4, amplified by U1-A and U1-B, and then used as a variable bias on the varactor diodes. As the bias is varied, so is the capacitance of the varactor diodes. The amplifier stages U1A and U1B are used to provide both isolation and a low impedance driving source for the varactor diodes. The oscillator tuning range in the AUTO Mode varies from 30.06 MHz to 42.50 MHz.

4.3.3.3 Transistors Q5, Q6, and Q7 are arranged to provide a non-inverting buffer amplifier for the oscillator output signal. The amplifier gain which is set by resistors R18 and R20 provides an output signal level of +6 dBm at BB LO Output connector J1 for connection to the Baseband Converter module (A5). A second output signal is divided by resistors R23 and R24 to provide a 0 dBm level to the IF Local Oscillator module (A3) through BB LO Output connector J2.

4.3.3.4 Diode CR2 and amplifier U2 are connected to provide an automatic level control (ALC) which varies the oscillator bias through transistor Q2. This arrangement holds the Baseband Local Oscillator outputs constant over the entire tuning range.

4.3.4 Baseband Converter Module (A5). A block diagram of the Baseband Converter module (A5) is shown in Figure 4-5. The Baseband Converter circuits receive a baseband signal input between 10 kHz and 12.5 MHz and upconverts the signal to 30 MHz first IF frequency. The IF signal is amplified and applied through a 30 MHz crystal bandpass filter. The crystal filter output signal is amplified and downconverted to the second IF frequency of 302.7 kHz. This second IF signal is buffer amplified and applied to the 302 kHz module (A6).

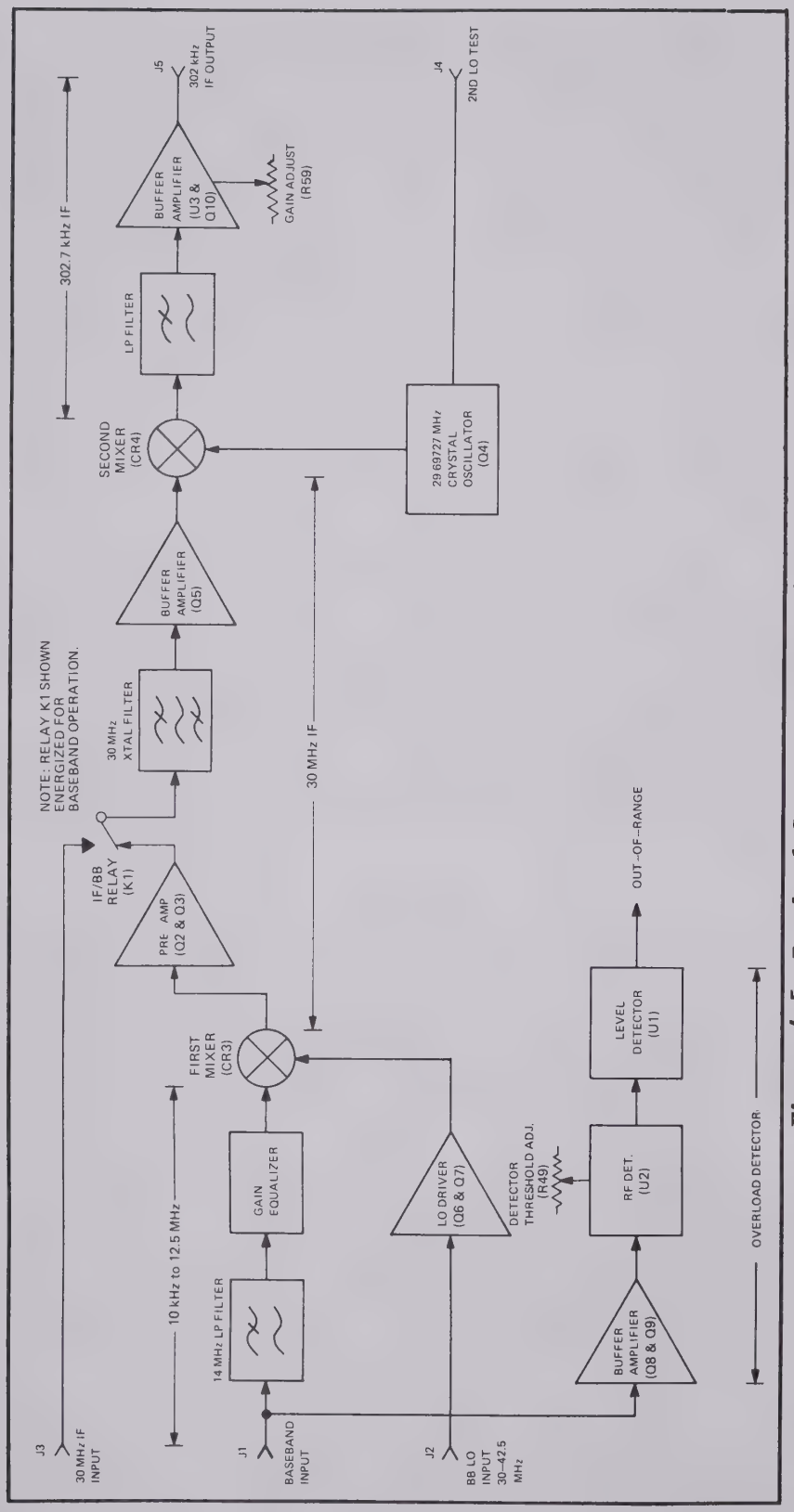

Figure 4-5. Baseband Converter Module (A5), Block Diagram

4.3.4.1 When the Model 4671 IF/Baseband Analyzer is operated in the IF Mode, a 30 MHz IF output signal from the IF Converter module (A4) is applied to the Baseband Converted input connector (J3) and through de-energized relay K1 contacts to the 30 MHz crystal bandpass filter. The signal is then processed the same as IF signals in the Baseband Mode of operation.

4.3.4.2 Selecting the Baseband Mode of operation causes +5V dc to be applied at feedthrough capacitor C1 to reverse bias diode CR1 (see Figure 7-24). When diode CR1 is reverse biased, current through resistor R1 enables transistor Q1 to energize relay K1.

4.3.4.3 The baseband input signal at connector J1 is applied through a 14 MHz low-pass filter consisting of inductors L8 through L10 and capacitors C19 through C25. This filter suppresses out-of-band signals and reduces spurious responses that could be caused by an out-of-band input. The 14 MHz low-pass filter also attenuates the LO signal that reflects from the operation of the first mixer (CR3). The LO signal must be attenuated to less than -75 dBm at connector J1.

4.3.4.4 The output of the 14 MHz low-pass filter is gain equalized through two networks consisting of capacitors C26, C27, inductors L11, L12, and resistors R16 through R20. The second equalizer compensates for loss in the 14 MHz low-pass filter and mixer response. The equalizer output signal is applied to the first mixer (CR3).

4.3.4.5 The 30 MHz IF output signal from the first mixer (CR3) is applied to a buffer amplifier using transistors Q2 and Q3. The gain of this amplifier stage is 8.7 dB.

4.3.4.6 When operating in the Baseband Mode, relay K1 is energized and the output signal from transistor Q3 is capacitively coupled through closed relay contacts to the 30 MHz crystal bandpass filter. The crystal filter consists of a tandem pair of monolythic crystals (Y2A and Y2B) and matching networks. The crystal filter impedance is matched to the source (using capacitors C29, C30, and inductor L13) and to the load (using capacitors C32, C33, and inductor L14). The coupling reactance is adjusted by capacitor C31 and inductor L21.

4.3.4.7 The local oscillator drive for the second mixer (CR4) is obtained from the 29.69727 MHz crystal oscillator (transistor Q4 and associated components). This oscillator is a Colpitts type with the crystal (Y1) in series with the emitter feedback. The output of oscillator transistor Q4 is applied through a low-pass filter (using capacitor C64 and inductor L7) to pin 8 of the second mixer (CR4).

4.3.4.8 The 302.7 kHz IF output signal from the second mixer (CR4) is applied through a low-pass filter (using capacitors C57, C50, C65, and inductor L16) to the buffer amplifier circuit of U3, transistor Q10, and associated components. Integrated circuit U3 is a differential amplifier and the output signal is buffered by transistor Q10 with part of the signal returned from the emitter of Q10 through resistor R64 to the inverting input of U3.

4.3.4.9 The Baseband Local Oscillator (A13) provides an input signal between 30.01 and 42.50 MHz at a +6 dBm level to connect J2. The input signal is amplified by the LO driver circuit using transistors Q6 and Q7 to a ±23 dBm level and then applied to pin 8 of the first mixer (CR3).

4.3.4.10 A sample of the baseband input signal applied to connector J1 is capacitively coupled through C44 to the overload detector circuit. The signal is buffer amplified by transistors Q8 and Q9, then coupled through capacitor C46 to the RF detector circuit U2. The RF detector circuit consists of a pair of temperature-controlled matched transistors operating at an elevated temperature and connected as diodes. The circuit contains an internal controlled heating arrangement. A bias current through resistor R50 is applied to the diode detector arrangement (pins 1 and 9 to pin 10 of U2) together with the applied baseband signal. As the baseband signal amplitude increases, the diode impedance decreases and the bias voltage becomes less positive. When the voltage at pins 1 and 9 becomes less positive than the voltage at pins 2 and 4, the output of the level detector U1 goes positive indicating an overload. The trip point is set by the variable Detector Threshold Adjust resistor (R49).

4.3.5 IF LO Module (A3). A block diagram of the IF LO Module (A3) is shown in Figure 4-6. Input signals to the IF LO Module are provided from the Baseband LO Module (A13) at a frequency between 30 and 42.5 MHz and a level of approximately 0 dBm. The input signal is buffer amplified by transistors Q1 and Q2, and applied to a MECL decode divide-by-10 counter (U1). Output signals from the counter (U1) stage are applied to a TTL dual Nand buffer (U2) stage. One buffered output signal is applied to the BB F/10 connector J3 for the Scan Control printed circuit board (A1A5). The second buffered output signal is applied to the digital phase detector (U3) circuit.

4.3.5.1 The second input signal required by the digital phase detector (U3) is derived from a divide-by-60 chain consisting of a MECL divide-by-10 circuit (U5) and a TTL divide-by-6 circuit (U4). Input signals for the divide-by-60 chain is provided through a buffer amplifier using transistors Q7 and Q8 which sample the IF LO output signal.

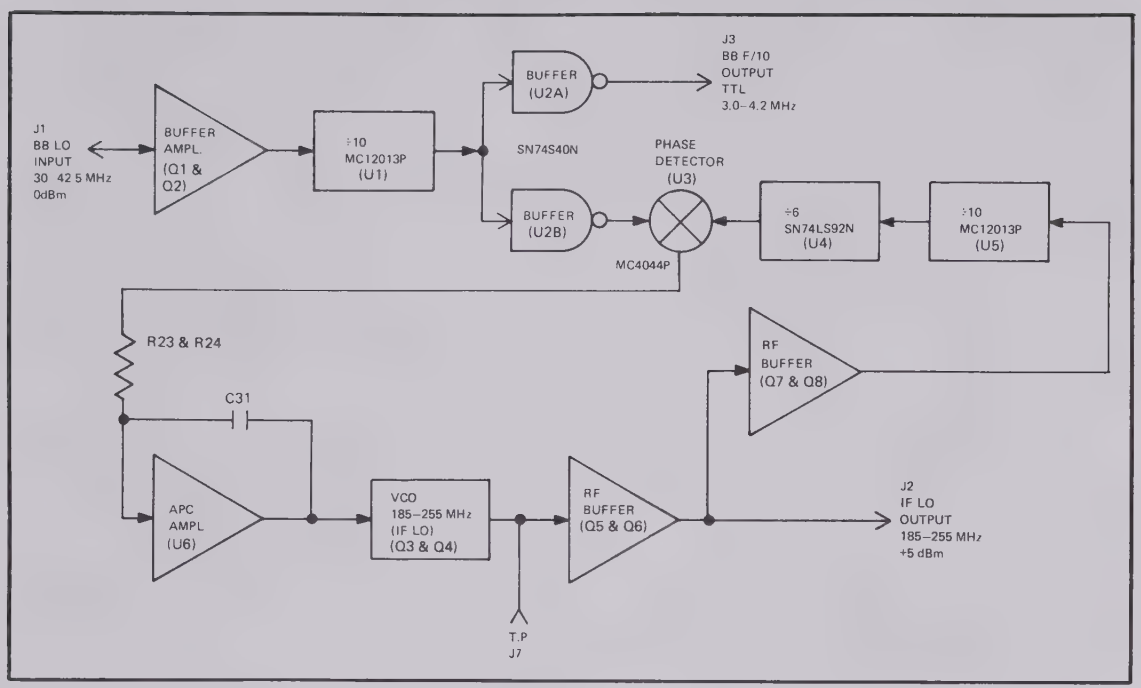

Figure 4-6. IF LO Module (A3), Block Diagram

4.3.5.2 The error signal output from the digital phase detector (U3) is filtered by the integrator formed about the automatic phase control (APC) amplifier (U6). The APC amplifier (U6) output signal is then coupled to the varactor control diodes in the voltage controlled oscillator (VCO) circuit which uses transistors Q3 and Q4. The VCO circuit generates the IF LO frequency which is buffered from the IF LO OUTPUT jack (J3) by transistors Q5 and Q6.

4.3.5.3 The VCO digital frequency control loop first reacts as an automatic frequency control (AFC) loop to achieve signal lock, and then as a type 2 APC loop after acquisition of signal lock.

4.3.6 IF Converter Module (A4). A block diagram of the IF Converter module is shown in Figure 4-7. Signals through relay contacts in the Input Attenuator assembly are applied to the IF Converter Module, through the IF Input connector (J1). These input signals, in the frequency range of 35 to 105 MHz, are first filtered by a ninth order Cauer elliptic 110 MHz low pass filter. The filtered output signal is buffer amplified by transistors Q6 and A7 and applied to a double-balanced mixer (Z1). The second input to mixer (Z1) is a signal between 185 and 255 MHz through IF LO Input connector (J2) from the IF LO module (A3). Thus the buffered input signal to mixer (Z1) is upconverted to provide a 150 MHz output frequency as the IF LO Module (A3) signal is tuned over the 185 to 255 MHz range.

4.3.6.1 The first buffer amplifier using transistors Q6 and Q7 is designed for both low signal distortion and a large input signal return loss. A Slope Adjust control (C56) allows the 35 to 105 MHz amplitude frequency response of the buffer to be adjusted to cancel slope amplitude errors caused by the low pass filter and the Input Attenuator.

4.3.6.2 The upconverted 150 MHz signal is first buffer amplified by transistors Q8 and Q9 and then applied to a double tuned 150 MHz bandpass filter having a bandwidth of 5 MHz. The 150 MHz filtered signal is buffer amplified again by transistors Q10 and Q11 before being applied to a double-balanced second mixer (Z2). In addition to amplification, the two buffer stages provide the necessary isolation for proper operation.

4.3.6.3 The local oscillator signal of the second mixer (Z2) is provided by a 120 MHz crystal oscillator (transistor Q14) through a buffer amplifier using transistors Q12 and Q13. The buffer amplifier provides isolation to the oscillator from the possibility of reflected signals by the second mixer (Z2) operation.

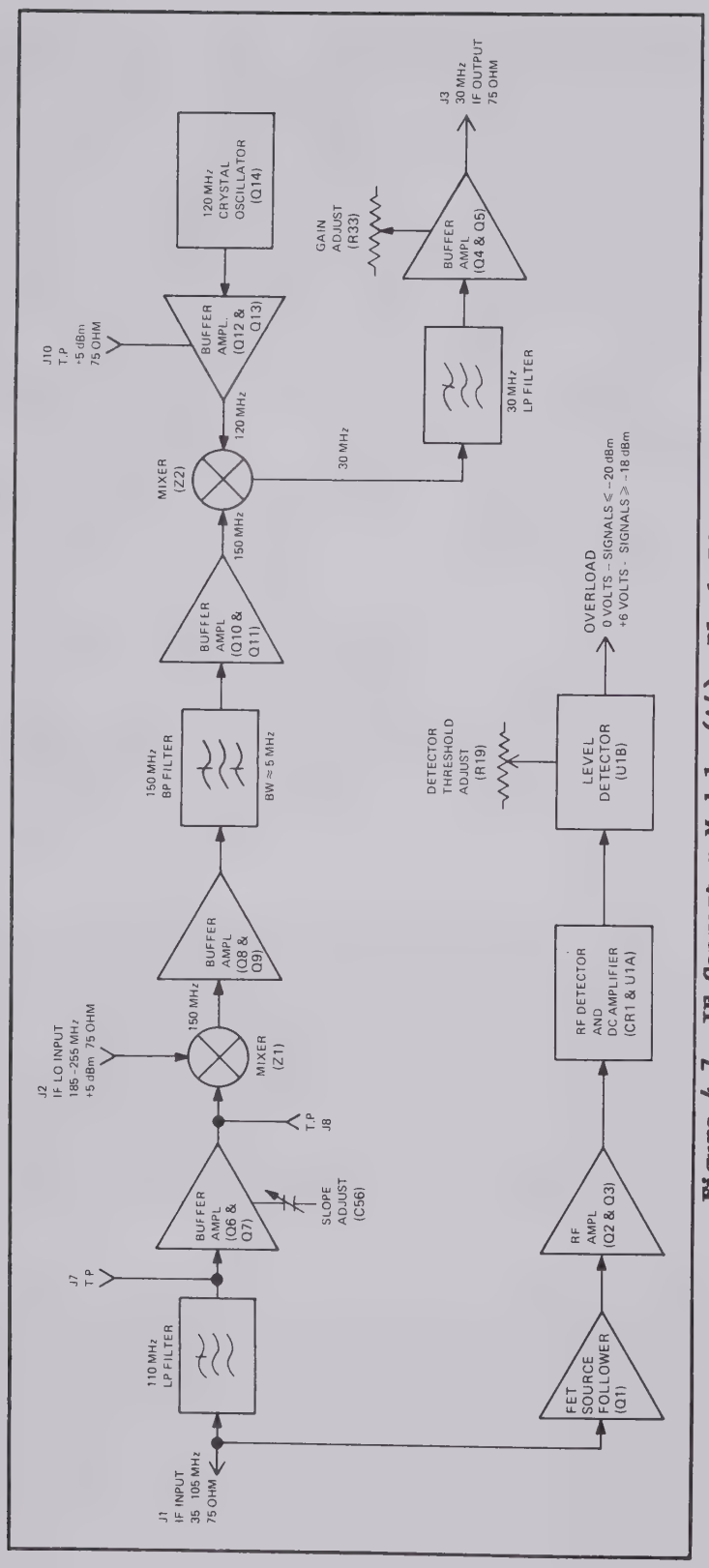

Figure 4-7. IF Converter Module (A4), Block Diagram

4.3.6.4 Output signals from the second mixer (Z2) are filtered by a 30 MHz low pass filter and buffer amplified by transistors Q4 and Q5 before being applied to the 30 MHz IF Output jack (J3). The Gain Adjust control (R33) establishes the signal output level of the overall IF Converter module (A4) conversion to be typically 0 dB.

4.3.6.5 The overload detection circuit, which is part of the IF Converter module (A4) circuits, consist of an FET source follower (transistor Q1), an RF Amplifier (transistors Q2 and Q3), and RF Detector (CR1), a dc amplifier (U1A), a level detector (U1B) and associated components. The Detector Threshold Adjust control (R19) provides an overload indication (flashing front panel decimals in LEVEL - dBm digital display) by supplying +6 volts dc when the applied input signal level is greater than -18 dBm.

4.3.7 302 kHz IF Module (A6). A block diagram of the 302 kHz IF module (A6) is shown in Figure 4-8. The 302 kHz IF module provides filtering and frequency translation for the 302.7 kHz signal from the Baseband Converter Module (A5). The input signal is first applied through a 30 kHz wide bandpass filter which is centered about 302.7 kHz. The filtered signal is then applied to buffer amplifier U1 which compensates for insertion loss of the filter. Transformer T1 and the switching components contained in U2 and U3 are arranged to form a mixer whose output is 30 kHz. Mixing is accomplished by the alternate operation of a shunt-series pair of CMOS switches (U2 and U3) being operated by the 272.7 kHz oscillator through buffer amplifier U5.

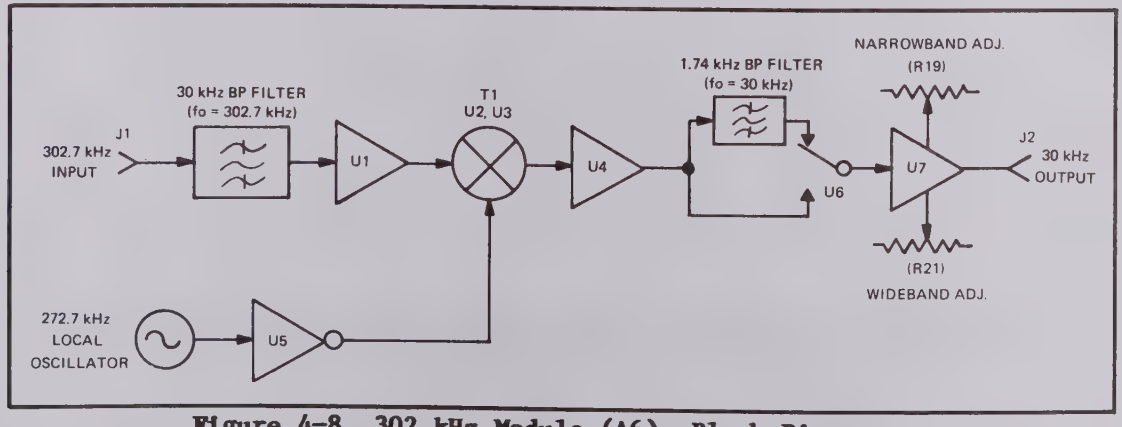

Figure 4-8. 302 kHz Module (A6), Block Diagram

4.3.7.1 Buffer amplifier U4 compensates for the mixer signal loss and a high frequency roll off characteristic to suppress the 272.7 kHz local oscillator signal. Output signals from buffer amplifier U4 are either applied through a 1.74 kHz bandpass filter (centered about 30 kHz) or applied directly to output amplifier U7 under control of the CMOS switch arrangement U6. The switch arrangement U6 provides a filtered 30 kHz signal for Baseband and NPR testing and a direct 30 kHz signal for the remaining test capabilities through logic circuits associated with the front panel test switches.

4.3.7.2 Output amplifier U7 circuit arrangement is provided with two variable gain controls, R19 and R21, so the gain of the 302 kHz IF Module output signal can be adjusted to a 0 dB level whether the 1.74 kHz filter is selected or not.

4.3.8 30 kHz IF Module (A2). A block diagram of the 30 kHz IF module (A2) is shown in Figure 4-9. The 30 kHz IF module is basically a variable gain amplifier which can provide from 0 to 50 dB gain in 1 dB increments with a flat passband of 15 kHz to 45 kHz. After the amplifier stages the signal is applied through one of two filters, depending on the mode of operation, to the output amplifier (U13). A 1.74 kHz bandpass filter is selected when in the Tone Search or NPR mode or a 100 kHz low pass

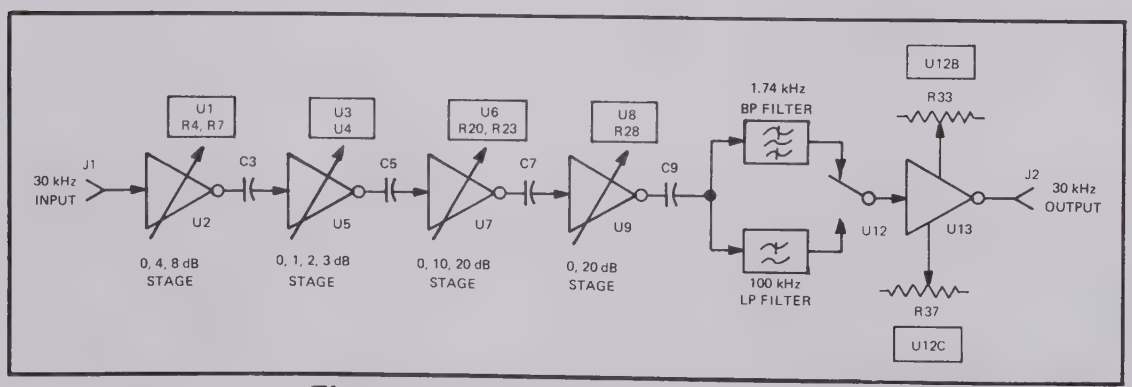

Figure 4-9. 30 kHz Module (A2), Block Diagram

filter is selected for operating in the Baseband test mode. The 100 kHz filter further reduces any of the 272.7 kHz local oscillator signal present on the input signal from the 302 kHz IF module (A6).

4.3.8.1 A three section CMOS switch is connected in a series-shunt arrangement for switching various summing and feedback resistors into or out of the amplifier circuits. The block diagram shown in Figure 4-10 shows that the series switch U1A is closed and shunt switches U1B and U1C are also closed. Shunt switches U1B and U1C ground signals on summing resistors R3 and R6 while series switch U1A connects the junction of resistors R1 and R2 to the inverting input of J2. Only one series switch will be closed at a given time while all of the other shunt switches for that stage are closed. Variable resistors R4 and R7 provide adjustment to precisely set the gain of the stage.

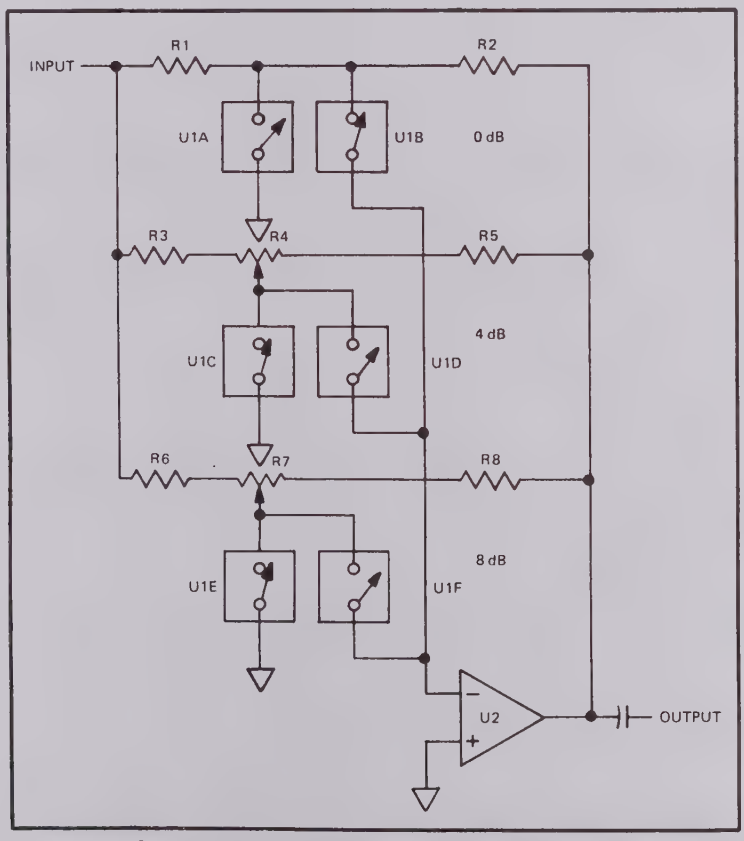

Figure 4-10. 30 kHz IF Module (A2) CMOS Switch Arrangement, Block Diagram

4.3.8.2 The gain of the remaining stages are adjusted in a manner similar to the description in 4.3.8.1. Insertion loss of the two output filters is compensated for at the output stage with individual gain adjustments.

4.3.9 Digital Display. A block diagram illustrating the interconnection of circuits necessary for the front panel digital display is shown in Figure 4-11. Descriptions directly applicable to the Attenuator Logic assembly, Display Interface Assemblies (A12 and A12A1), the Lamp Logic Assemblies (A7 and A7A1), the Counter circuits (A1A2), and the A/D Converter and Arithmetic circuits (A1A1) are included in the following paragraphs.

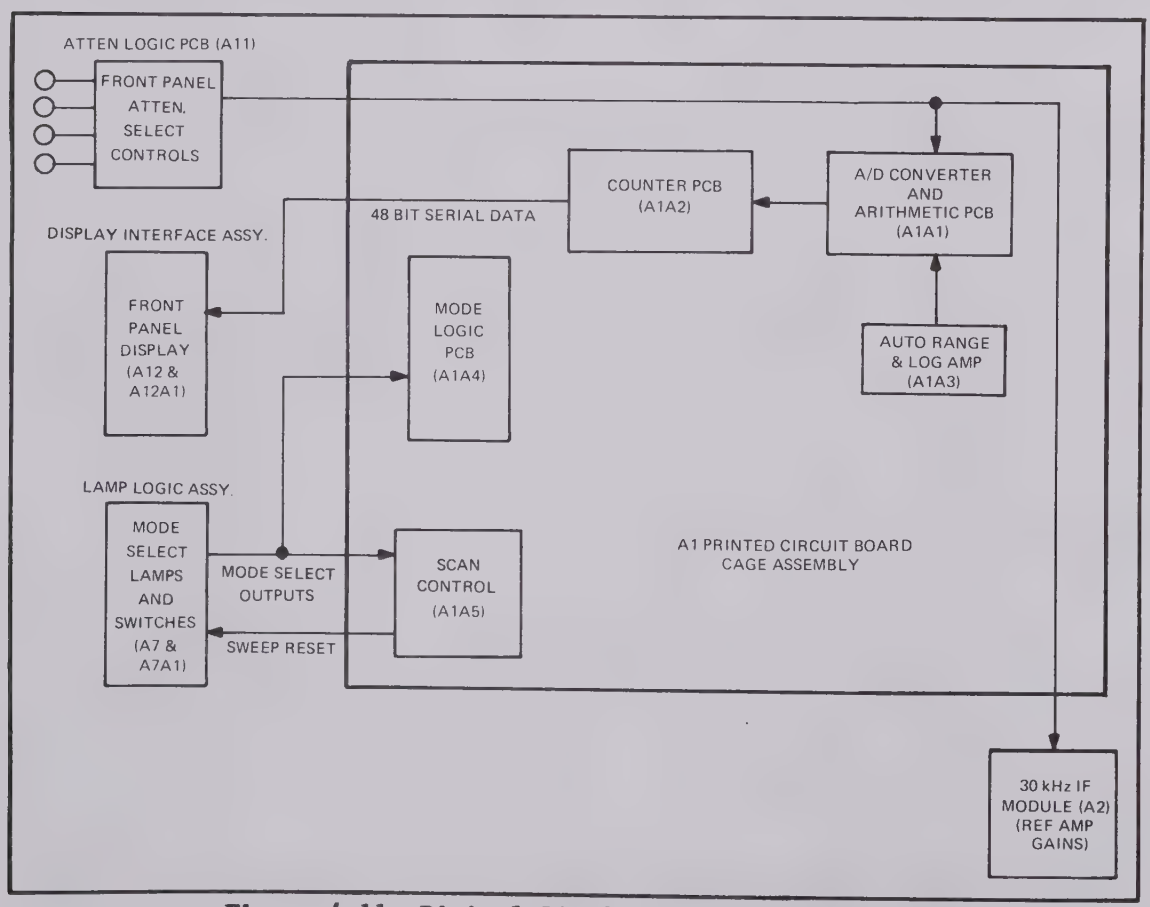
ATTEN LOGIC PCB (A11)
FRONT PANEL ATTEN. SELECT CONTROLS
COUNTER PCB (A1A2)
A/D CONVERTER AND ARITHMETIC PCB (A1A1)
48 BIT SERIAL DATA
DISPLAY INTERFACE ASSY.
FRONT PANEL DISPLAY (A12 & A12A1)
MODE LOGIC PCB (A1A4)
AUTO RANGE & LOG AMP (A1A3)
LAMP LOGIC ASSY.
MODE SELECT LAMPS AND SWITCHES (A7 & A7A1)
MODE SELECT OUTPUTS
SWEEP RESET
SCAN CONTROL (A1A5)
A1 PRINTED CIRCUIT BOARD CAGE ASSEMBLY
30 kHz IF MODULE (A2) (REF AMP GAINS)

Figure 4-11. Digital Display, Block Diagram

4.3.9.1 The front panel assemblies include the following circuits:

a. The Display Interface assemblies (A12 and A12A1) which provide both frequency and analog direct reading displays.
b. The Lamp Logic assemblies (A7 and A7A1) which include the Interlock logic for test mode selection using front panel momentary switches with the lamp circuits to illuminate the selected test mode lamps. The Attenuator logic circuits which are controlled by front panel rotary switches to select the proper input attenuation and reference amplifier gains.

4.3.9.2 The printed circuit board cage assembly (A1) contains the Counter (A1A2) circuits, the A/D Converter and Arithmetic (A1A1) circuits, the Sweep Generator and Mode Logic (A1A4) circuits, and the Scan Control (A1A5) circuits. These circuits are all interconnected through a Motherboard (A1A10).

4.3.9.3 Counter Printed Circuit Board (A1A2). A block diagram of the Counter printed circuit board (A1A2) is shown in Figure 4-12 and a timing diagram illustrating the sequence of Counter functions is shown in Figure 4-13. The sequence of events is best described using Figure 4-13. A 500 kHz crystal controlled reference frequency (A1) is applied to generate a 200 msec sampling gate. The 200 msec gate signal (1B) is detected and closes the gate (shown in Figure 4-12). At this time, a command to load the parallel data (1C) signal is generated and the parallel data is loaded into the parallel-to-serial converters. A data strobe signal (1D) is generated at time t_2 and causes the counters to reset and preset (iE) and starts the 48-bit clock pulse generator output (1G). A gate start enable command (1F) at time t_5 allows the 200 msec gate to open at time t_6.

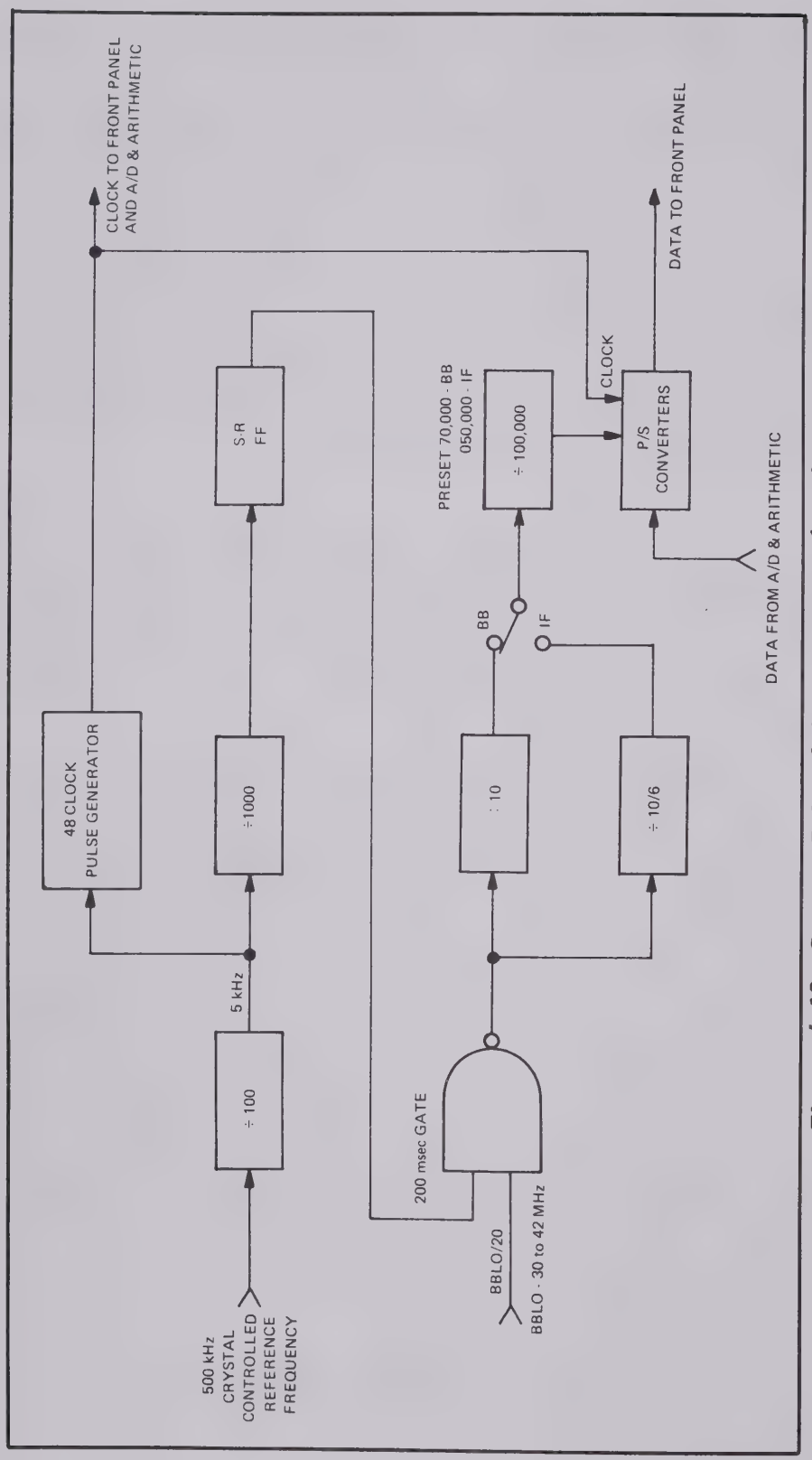

Figure 4-12. Counter Printed Circuit Board (A1A2), Block Diagram

4.3.9.4 The Counter circuits shown in the block diagram (Figure 4-12) provide a Control function, a Count function and a Clock Generator function. The Control function uses the 500 MHz reference input signal to generate both control and timing functions. The 500 kHz signal is divided by 100 to produce a 5 kHz reference signal and 1000 counts of the reference signal produces the 200 msec gate pulse. Generation of the 200 msec pulse also initiates the Control functions shown in Figure 4-13 as (1C), (1D), (1E), and (1F). The generation of the Gate Start Enable (1F) allows the positive leading edge of time t_6 to start the 200 msec time period (and the start of the 1000 counting sequence).

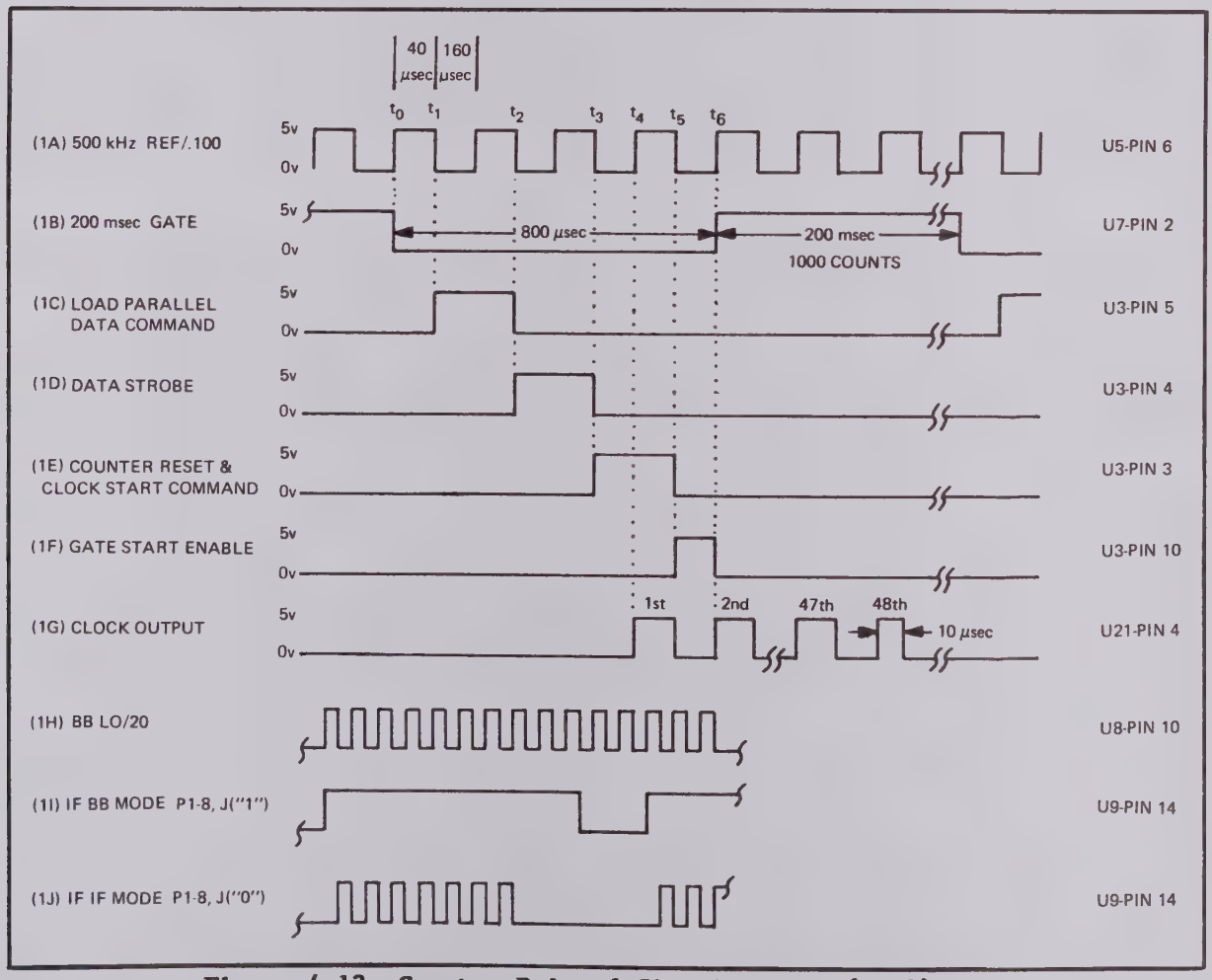

Figure 4-13. Counter Printed Circuit Board (A1A2), Timing Diagram.

4.3.9.5 The Count function is provided by a series of divide-by-ten BCD counters with a switchable counter at the input to the chain. The switchable counter is logic controlled by the Baseband Mode Select command to either (a) divide-by-ten when in the Baseband Mode, or (b) divide-by-1.67 when in the IF Mode. The counters are driven by the BB LO/20 input during the 200 msec sample period. (The BB LO frequency varies between 30 MHz and 42.5 MHz, therefore, the counter input varies between 1.5 MHz and 2.125 MHz.) If the circuits are in the Baseband Mode, the counters are preset to 070,000 kHz to subtract out the first IF (30 MHz) from the Baseband Converter. If the circuits are in the IF Mode, the counters are preset to 050,000 kHz to subtract out the first IF (150 MHz) from the IF Converter. Remember that the IF LO is phase-locked to the BB LO by a factor of 6, therefore, the counter will count the BB LO at 6 times the BB count rate when in the IF Mode (i.e., divide-by-1.67 versus divide-by-10).

4.3.9.6 Data to the front panel incorporates leading zero blanking on all digits except the ten's and unit's digits. If the BB LO/20 input is tuned below 1.5 MHz, an underrange output signal is generated and provided to the front panel to flash the frequency display decimal points and alert the operator.

4.3.9.7 The Clock Generation function provides a 48-bit 5 kHz signal to clock the serial data to the front panel circuits for display. It is initiated at time t_4 (Figure 4-13) and the 48th pulse is identified by only being approximately 10 µsec wide.

4.3.9.8 Sweep Generator and Mode Logic Printed Circuit Board (A1A4). A block diagram of the Sweep Generator and Mode Logic printed circuit board (A1A4) is shown in Figure 4-14. The Sweep Generator and Mode Logic circuits provide:

a. The generation of various sweep speeds for AUTO mode scanning,
b. A summing amplifier to set the gain in the baseband local oscillator VCO loop, and,
c. Logic circuitry to generate various logic signals needed to switch analog circuitry during various modes of operation.

4.3.9.8.1 The Mode Logic, comprised of U1 through U7, accepts the switching mode commands from the front panel lamp logic board and the Baseband Scan switch. These input signals are:

a. BB Mode (true when any baseband mode is selected)
b. 70±35 MHz
c. 70±25 MHz
d. BB RESPONSE
e. RECORD
f. Sweep On (true when both AUTO SCAN and RECORD are selected)
g. 12.5 MHz
h. 6.0 MHz
i. 1.5 MHz
j. .75 MHz
k. NPR RETRACE
1. NPR Slow Scan

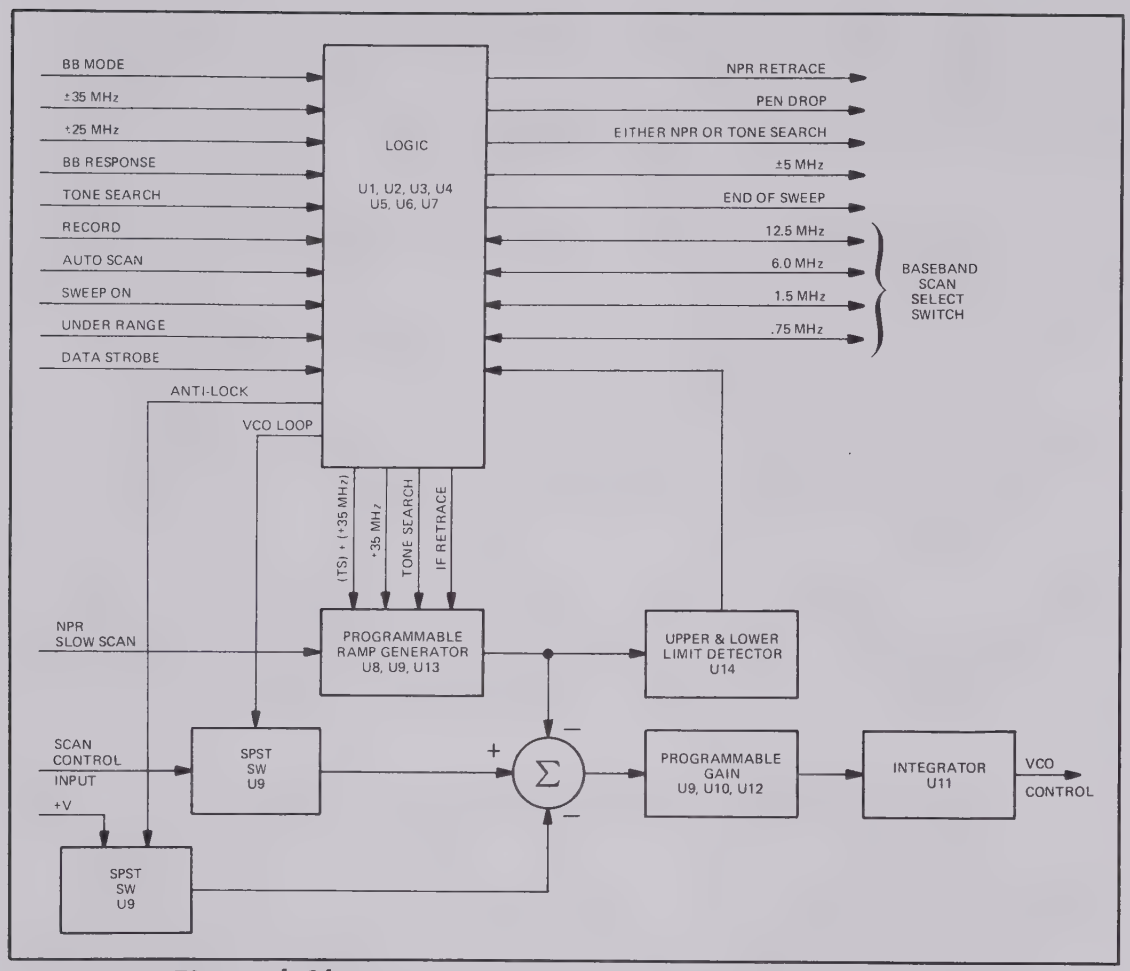

Figure 4-14. Sweep Generator and Mode Logic Printed Circuit Board (A1A4), Block Diagram

4.3.9.8.2 These inputs are combined with upper and lower scan limits to control the VCO loop gain, the auto scan sweep times and the sweep direction. The input signals also generate the following logic functions:

a. Pen drop
b. Narrow filter bandwidth selection (true when either NPR or Tone Search is selected)
c. +5 MHz Sweep Select
d. End of Sweep

These functions are generated for other circuits used in the Model 4671 IF/Baseband Analyzer arrangement. The logic circuits also accept an Under Range signal input and a Data Strobe signal input from the Counter printed circuit board (A1A2). The two signals prevent the VCO from locking up on the wrong sideband of the Baseband Local Oscillator (A13). The board also accepts the NPR retrace and NPR slow scan input signals from the Meter and Recorder Interface board. These two signals control the frequency sweep speed when in the NPR-Mode.

4.3.9.8.3 The programmable ramp generator consisting of U8, U9 and U13 generates a negative going ramp. The time required for this signal to go from the lower limit to the upper limit is a function of the selected mode. In all modes, except Tone Search and 70±35 MHz, the forward sweep time is approximately 45 seconds. In the Tone Search Mode, the forward sweep time is approximately 180 seconds, or if in the 70±35 MHz mode, the forward sweep time is approximately 70 seconds. In the NPR Mode, a circuit is activated on the Meter and Recorder Interface printed circuit board (A1A6). This circuit senses the rate of signal change in the Y axis. When the rate of change exceeds the threshold, the recording pen lifts, the carriage backs up, the pen drops, and the scan continues forward slowly for a predetermined time before continuing at the normal rate. During all baseband modes, the retrace time is limited only by the Model 4673 X-Y Recorder response, but in all IF modes the retrace time is purposely slowed down to prevent the phase lock loop in the IF Local Oscillator (A3) from losing lock. The NPR retrace period is the same as the retrace time for the IF Local Oscillator and the NPR slow scan period is controlled by U8-A.

4.3.9.8.4 When operating in the AUTO MODE, the dc voltage which is proportional to the frequency generated on the Scan Control printed circuit board (A1A5) is summed with the sweep signal in amplifier U12. This summed signal is then applied to an integrator providing the control voltage for the Baseband Local

Oscillator (A13) VCO circuit. A CMOS switch in U9 and U10 changes the loop gain for the various modes. Another CMOS switch in U9 applies an anti-lock signal to the summing point when commanded by the logic driving the VCO for correction of the starting frequency. Circuits of U14 detect the upper and lower scan limits and develop a control signal which is returned to the Mode Logic Circuit of U1 through U7.

4.3.9.9 Scan Control Printed Circuit Board (A1A5). A block diagram of the Scan Control printed circuit board (A1A5) is shown in Figure 4-15. The Scan Control circuits provide for conversion of the Baseband Local Oscillator (A13) frequency divide-by-10 (BB LO/10) to a dc voltage for controlling the Baseband Local Oscillator (A13) VCO loop. Scan Control circuits also provide the various signals used as reference frequencies within the Model 4671 IF/ Baseband Analyzer, the crystal oscillator, U1, generates a precise 6 MHz signal which is applied to the frequency dividing circuits U2 and U3 to generate output frequencies of 3 MHz and 500 kHz. The BB LO/10 input signal from the IF LO Module (A3) is also applied to the U3 where the signal is divided by two, thus generating the BB LO/20 output signal.

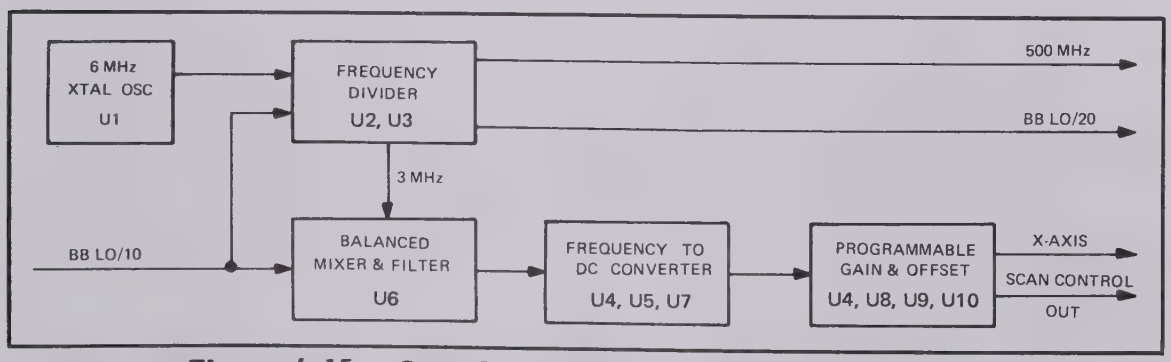

Figure 4-15. Scan Control Printed Circuit Board (A1A5), Block Diagram

4.3.9.9.1 Both the 3 MHz signal and the BB LO/10 signal are applied to the balanced mixer U6. The frequency of the BB LO/10 signal input varies from 3.0 to 4.25 MHz as the Model 4671 IF/ Baseband Analyzer is tuned over the dynamic range. This causes the mixer output to vary proportionally to the input signal from 0 to 1.25 MHz in either MANUAL Tune Mode or AUTO Scan Mode. The mixer output signal is then applied to a frequency-to-voltage converter circuit using U4, U5, and U7. The converter output is then applied to a programmable gain circuit comprised of U4, U8, U9, and U10.

4.3.9.9.2 The gain and offset of the U9 circuit arrangement is selected by CMOS switches in U4 and U8. The gains and offsets vary for different scan widths and starting points required by the selected AUTO scan modes. The "X-AXIS" output signal from U10 is provided to drive the X-AXIS of a Model 4673 X-Y Recorder. The "SCAN CONTROL OUT" signal from U9 is applied to the Sweep Generator and Mode Logic printed circuit board (A1A4) input to control the closed VCO loop when operating in the AUTO Scan Mode.

4.3.9.10 Auto Range and Log Amplifier Printed Circuit Board (A1A3). A block diagram of the Auto Range and Log Amplifier printed circuit board (A1A3) is shown in Figure 4-16. The Auto Range

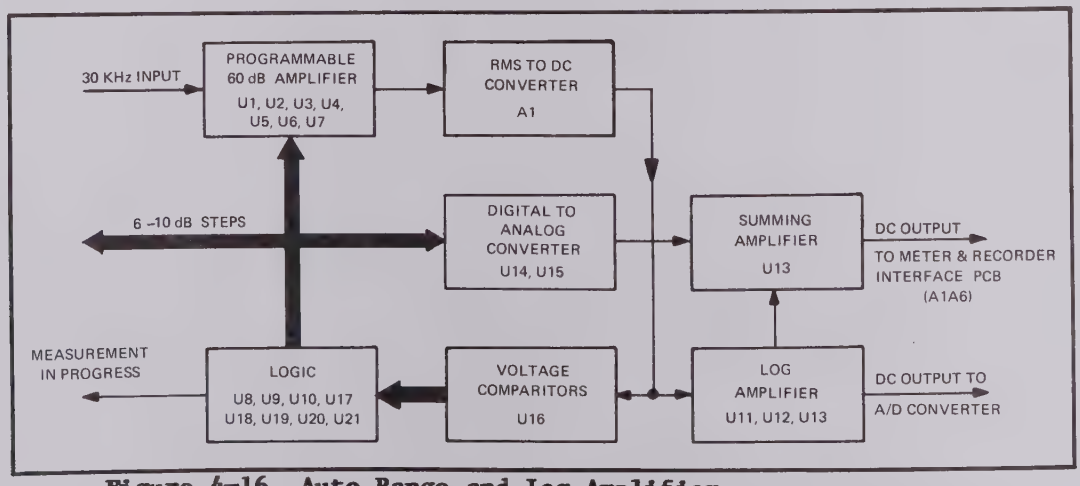
30 KHz INPUT
PROGRAMMABLE 60 dB AMPLIFIER U1, U2, U3, U4, U5, U6, U7
RMS TO DC CONVERTER A1
6 –10 dB STEPS
DIGITAL TO ANALOG CONVERTER U14, U15
SUMMING AMPLIFIER U13
DC OUTPUT TO METER & RECORDER INTERFACE PCB (A1A6)
MEASUREMENT IN PROGRESS
LOGIC U8, U9, U10, U17 U18, U19, U20, U21
VOLTAGE COMPARITORS U16
LOG AMPLIFIER U11, U12, U13
DC OUTPUT TO A/D CONVERTER

Figure 4-16. Auto Range and Log Amplifier, Printed Circuit Board (A1A3), Block Diagram

and Log Amplifier receives amplitude data from the 30 kHz IF Module (A2). This data is amplified, detected, and converted to a dc voltage output proportional to the logarithm of the true RMS input signal value.

4.3.9.10.1 The 30 kHz input signal is first applied to a programmable 60 dB amplifier which has three stages of gain. Each gain stage is capable of providing 0 dB, 10 dB, or 20 dB and can produce a total of 60 dB gain in programmed 10 dB steps under logic control. The amplifier output is applied to a true RMS detector which converts the 30 kHz signal to a proportional dc voltage output signal. The output dc voltage is sensed by voltage comparators which provide the logic circuit input. If the dc voltage is not within a predetermined range, the logic circuit commands the 60 dB amplifier to change in 10 dB steps until either (1) the dc voltage is within the predetermined range or (2) all the gain stages are switched in or switched out.

4.3.9.10.2 The six lines commanding the 10 dB gain steps provide signals for both the A/D Converter and Arithmetic printed circuit board (A1A1) and for the digital-to-analog converter circuit using U14 and U15 which provide a dc voltage proportional to each 10 dB change. With this method of circuit operation control, the output of the RMS converter is normalized to within 10 dB over a full dynamic range. The dc voltage output of the RMS converter is also applied to a log amplifier circuit using U11, U12, and U13 which provides an output voltage proportional to the logarithm of the input. The output voltage is summed with the digital-to-analog converter output voltage in summing amplifier U13 to provide a 70 dB dynamic range output voltage for the Meter and Recorder Interface printed circuit board (A1A6). Signals for the A/D Converter and Arithmetic printed circuit board (A1A1) consist of both voltages from the six gain control command lines and an output voltage from the logarithmic amplifier which will be further processed before being applied to the front panel LEVEL - dBm digital readout.

4.3.9.11 A/D Converter and Arithmetic Printed Circuit Board (A1A1). A block diagram of the A/D Converter and Arithmetic printed circuit board (A1A1) is shown in Figure 4-17. The function of the A/D Converter and Arithmetic circuits is to combine information from the Attenuator Logic printed circuit board (A11) and the Auto Range and Log Amplifier printed circuit board (A1A3) to compute a resultant signal level for the front panel LEVEL - dBm display. This computation is accomplished with a microprocessor based logic system.

4.3.9.11.1 Positive true logic levels from the Attenuator Logic printed circuit board (A11) provide the microprocessor with data relative to the front panel rotary switch positions. The data is a combination of 0 to 30 dB in binary format from the INPUT switches and 0 to 50 dB in BCD format from the REFERENCE switches both of which are summed in the microprocessor. When the front panel ZERO REF switch (A9S1) is operated, the front panel analog display will provide the sum of the INPUT and REFERENCE switch positions.

4.3.9.11.2 The A/D Converter circuit is a dual slope integrator. It has a nine bit resolution to resolve the output of the logarithmic amplifier on the Auto Range and Log Amplifier printed circuit board (A1A3) into an 18 dB range with 0.1 dB resolution. The 60 dB step logic inputs from the Auto Range and Log Amplifier circuits are added to this 18 dB A/D range to provide a 78 dB dynamic range for the analog system with any one given set of rotary switch positions. The output from the A/D is then summed with the data representing the rotary switch positions. This data is compiled into a serial bit stream which is transferred via a 48 bit 5 kHz clock to the front panel LEVEL -dBm display at a 5 Hz update rate.

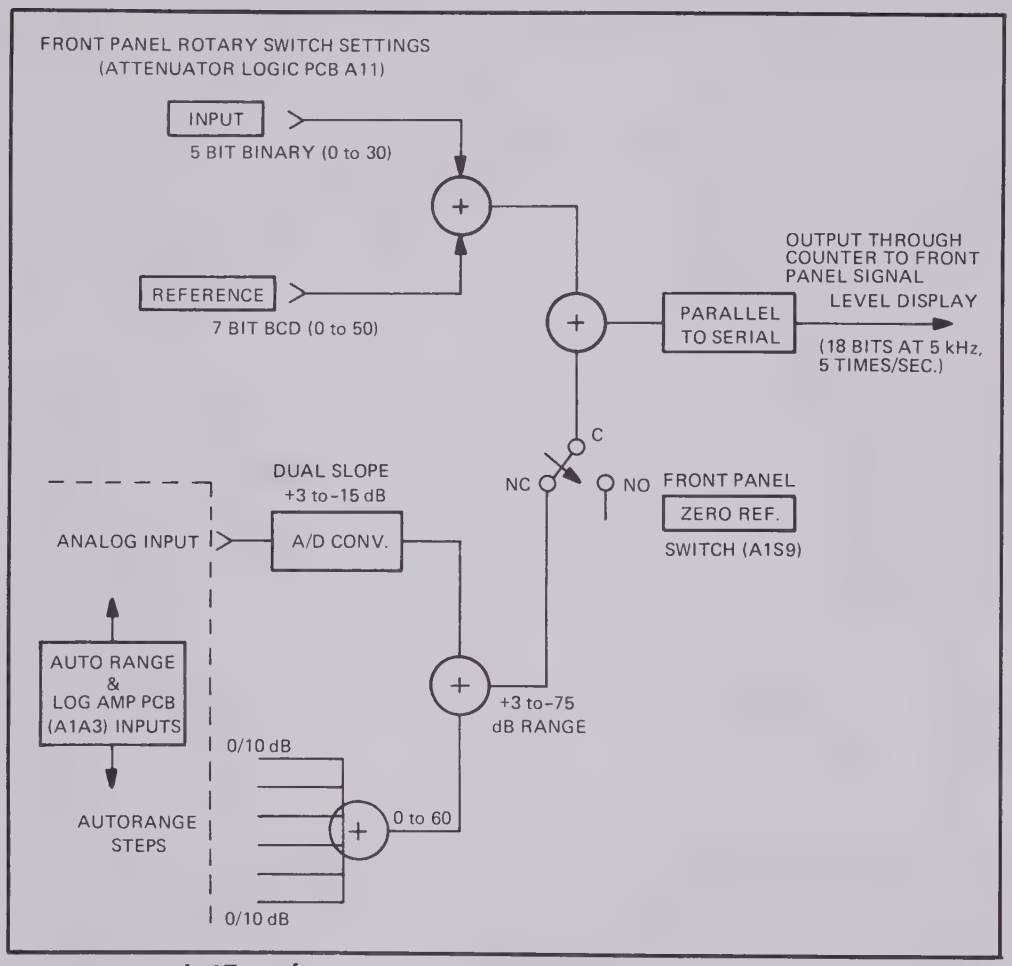

Figure 4-17. A/D Converter and Arithmetic Printed Circuit Board (A1A1), Block Diagram

4.3.10 Meter and Recorder Interface Printed Circuit Board (A1A6). A block diagram of the Meter and Recorder Interface printed circuit board (A1A6) is shown in Figure 4-18. The Meter and Recorder Interface circuits provide the gain and measurement bandwidths necessary for (1) the front panel analog meter to produce correct indications, and (2) the proper drive signals for the Y-Axis of the Model 4673 X-Y Recorder. The ±9 volt precision dc power source circuits are also contained on this printed circuit board as well as the rate of change detector and the time delay circuit required for the NPR Mode.

4.3.10.1 The dc analog input signal is first applied to a sample and hold circuit (U3) which holds information during an auto range update cycle. This arrangement provides a stage of isolation to prevent switching transients from reaching the Y-Axis output on the Model 4673 Recorder. The output of the sample and hold circuit is applied to a programmable gain and bandwidth stage and is controlled by logic circuitry switching correct gains

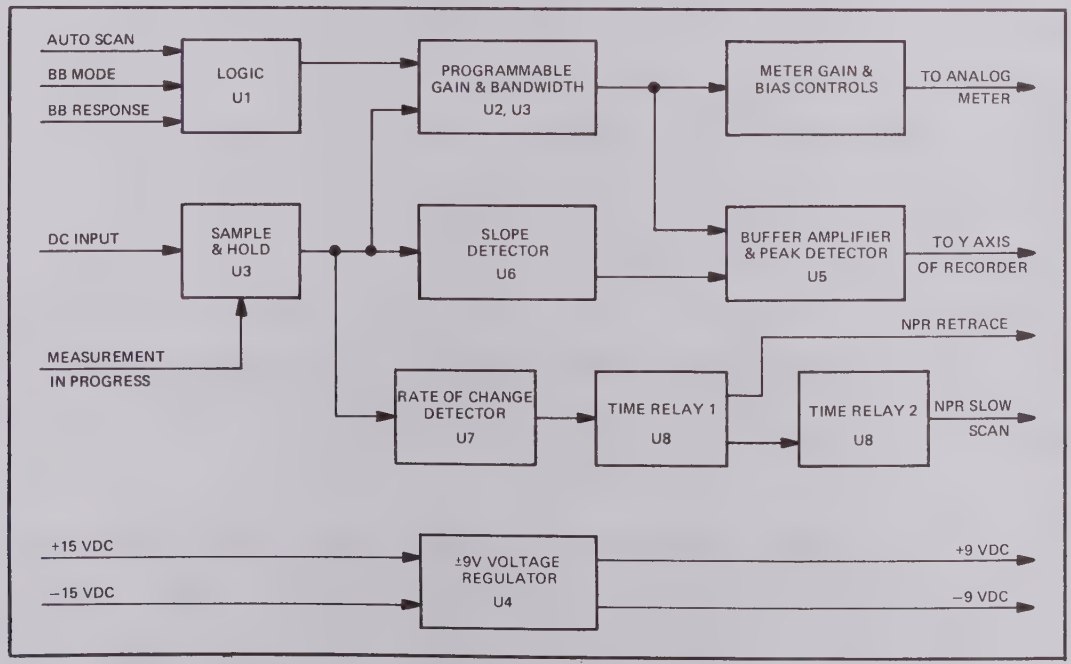

Figure 4-18. Meter and Recorder Interface Printed Circuit Board (A1A6), Block Diagram

and measurement bandwidths required for the various modes of operation as selected by the front panel switches. The programmable gain and bandwidth stage output is applied to a buffer amplifier and peak detector (U5). The output of the slope detector (U6) is also applied to this stage. When the slope detector senses a rate of signal rise greater than a predetermined value, the peak detector is activated and holds the peak value long enough to allow the Model 4673 X-Y Recorder to respond to a narrow pulse and graphically plot the peak value. This circuit is required to compensate for the slewing speed of the Model 4673 X-Y Recorder particularly in the Tone Search Mode.

4.3.10.2 The output of U3 is also applied to the front panel analog meter through offset and scale factor controls. Also on this printed circuit board is the precision ±9V Voltage Regulator which is described in Paragraph 4.2.14.

4.3.10.3 The output of the Sample and Hold circuit (U3) is also applied to the Rate of Change Detector circuit (U7). This circuit is activated only in the NPR Mode. When the signal changes faster than some predetermined amount and exceeds a predetermined value as set by the differentiator circuit U6, Time Delay 1 circuit is energized causing the pen to lift and the pen recorder carriage to back up in the X-axis. At the end of this time period, the Time Delay 2 circuit energizes and causes the pen to drop and the carriage to scan forward in the X-axis very slowly. At the end of this period, the X-axis scan returns to its normal speed. This allows the unit to follow very narrow notch widths and still keep a comparatively fast total full scale scan time.

4.3.11 Display Interface Printed Circuit Board (A12) and Digital Display Printed Circuit Board (A12A1). A block diagram which combines the functions of both the Display Interface printed circuit board (A12) and the Digital Display printed circuit board (A12A1) is shown in Figure 4-19. A timing diagram illustrating

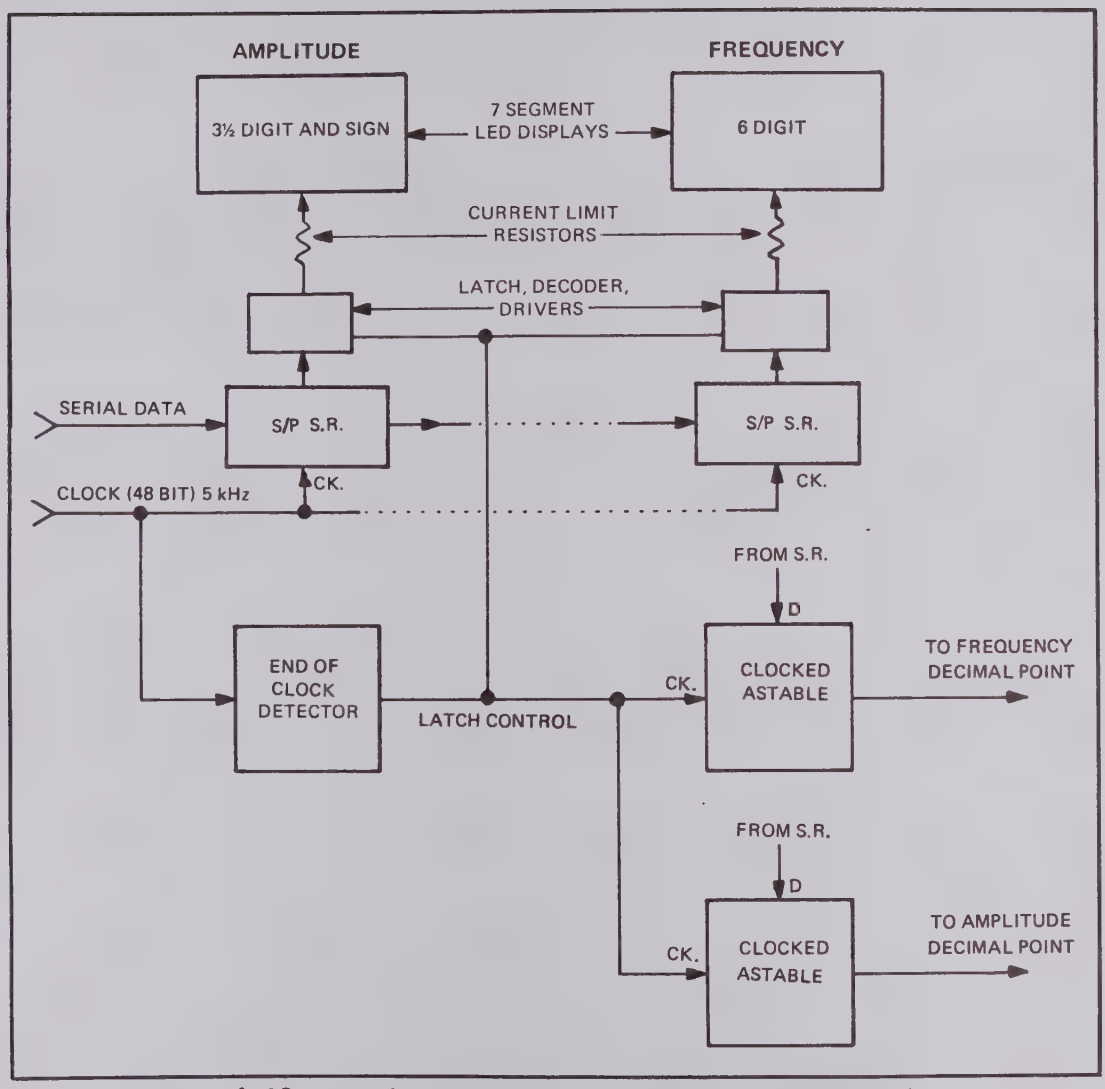

Figure 4-19. Display Interface Printed Circuit Board (A12) and Digital Display Printed Circuit Board (A12A1) Circuits, Block Diagram

the significant functions that are processed by the Display Interface circuits is shown in Figure 4-20. Basically, the circuits convert a 48-bit serial data input into parallel data required to drive the front panel LEVEL - dBm and FREQUENCY - kHz displays.

4.3.11.1 The serial data and clock input signals are provided from the Counter printed circuit board (A1A2). The serial data is loaded into serial-to-parallel registers by the 48 pulse clock. The data loading is delayed by an RC network to eliminate any signal racing conditions (illustrated by comparing waveforms (a) and (b) in Figure 4-20.

4.3.11.2 The End-of-Clock Detector circuit (Figure 4-19) is a dual retriggerable monostable which provides output waveforms illustrated in Figure 4-20 as (d) and (e). The STORE command (waveform e) allows paralleled data to be loaded into the Latch/Decoder/Driver circuits (Figure 4-19) and into the blanking latches. Two gatable 3 Hz (±30%) astable circuits provide the flashing output signal for the Frequency and Amplitude decimal point drivers.

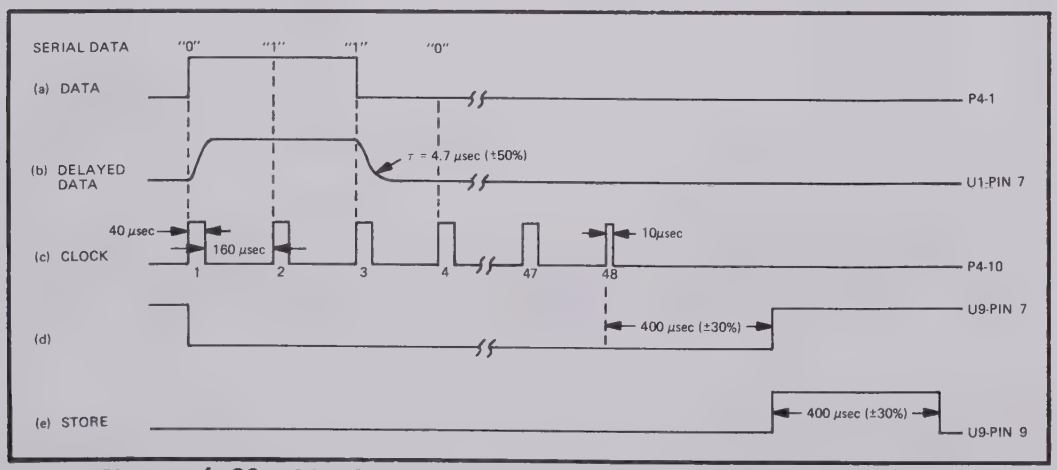

Figure 4-20. Display Interface Circuits, Timing Diagram

4.3.11.3 The analog meter scale lamps (which provide front panel indications to the right side of the analog meter) and their drivers are controlled by the BB RESPONSE switch mode select output. The 10 dB lamp is illuminated only by the BB RESPONSE mode. All other mode conditions cause the 70 dB lamp to be illuminated.

4.3.11.4 Decimal points on the LEVEL - dBm and FREQUENCY - kHz digital displays will flash when certain conditions exist. When an input signal to the Model 4671 IF/Baseband Analyzer is large enough to saturate the first stage, the decimal points in the LEVEL - dBm display will flash. Under some conditions, a lack of measurable input signal will also cause the decimal points in the LEVEL - dBm display to flash. Decimal points in the FREQUENCY - kHz display will flash only when the operator manually tunes below zero in the BASEBAND mode or below 30 MHz in the IF mode.

4.3.12 Lamp Logic Printed Circuit Board (A7) and Interlock Logic Printed Circuit Board (A7A1). The Lamp Logic printed circuit board (A7) provides (1) lamp drivers and lamps to illuminate the front panel Model Selection switches, (2) logic circuits to provide a return signal to the Sweep Generator and Mode Logic printed circuit board (A1A4). The Interlock Logic printed circuit board (A7A1) controls the enable functions of the front panel Mode Selection switches by allowing only one IF or Baseband Test Mode to be selected at a time. There is also a turn-on circuit on the Interlock Logic printed circuit board which insures that the Model 4671 IF/Baseband Analyzer always turns on in the BB RESPONSE, MANUAL Mode.

4.3.12.1 Functions of the IF and BB test mode switches have previously been described with appropriate circuits. Operation of the RECORD switch initiates control signals to the Model 4673 X-Y Recorder according to whether the MANUAL Mode or AUTO Mode is selected. When in the MANUAL Mode, operating the RECORD switch

will cause the pen to drop down. Operating the RECORD switch again will cause the pen to raise. In the AUTO Mode, operating the RECORD switch will cause the pen to drop and initiate the beginning of a sweep. Operating the RECORD switch again will cause the pen to raise and will reset the Model 4673 X-Y Recorder and pen to the Start Position at the left side of the grid paper.

4.3.13 Power Supply Printed Circuit Board (A1A9). A block diagram of the Power Supply printed circuit board (A1A9) is shown in Figure 4-21. Voltage from the transformer secondary windings are applied to bridge rectifiers CR1 and CR2. The voltage across bridge rectifier CR1 provides both the ±15 volt and -15 volt dc sources. Although physically constructed as a bridge rectifier, the transformer winding center tap permits rectifier CR1 to be connected as two separate center-tapped full-wave rectifiers of opposite polarity. Capacitors C1 and C5 filter the dc voltages applied to the ±15 volt regulator (U1) which, in turn, drives two series pass regulator transistors mounted on the rear panel. The parallel combination of resistors R3 and R4 provide a current limit of approximately 1.4 amperes for the +15 volt supply. Similarly, resistors R5 and R6 provide a current limit of approximately 1.0 ampere for the -15 volt supply. Variable resistor R11 will simultaneously adjust both 15 volt supplies.

4.3.13.1 The ac voltage applied across bridge rectifier CR2 provides the +5 volt source which is filtered by capacitor C9 and applied to two +5 volt regulators. One +5 volt regulator, which is mounted on the rear panel, provides a +5V dc source to the front panel and printed circuit boards A1A1 and A1A2. The second +5 volt regulator provides a quiet +5V dc source to the remaining circuits in the Model 4671 IF/Baseband Analyzer.

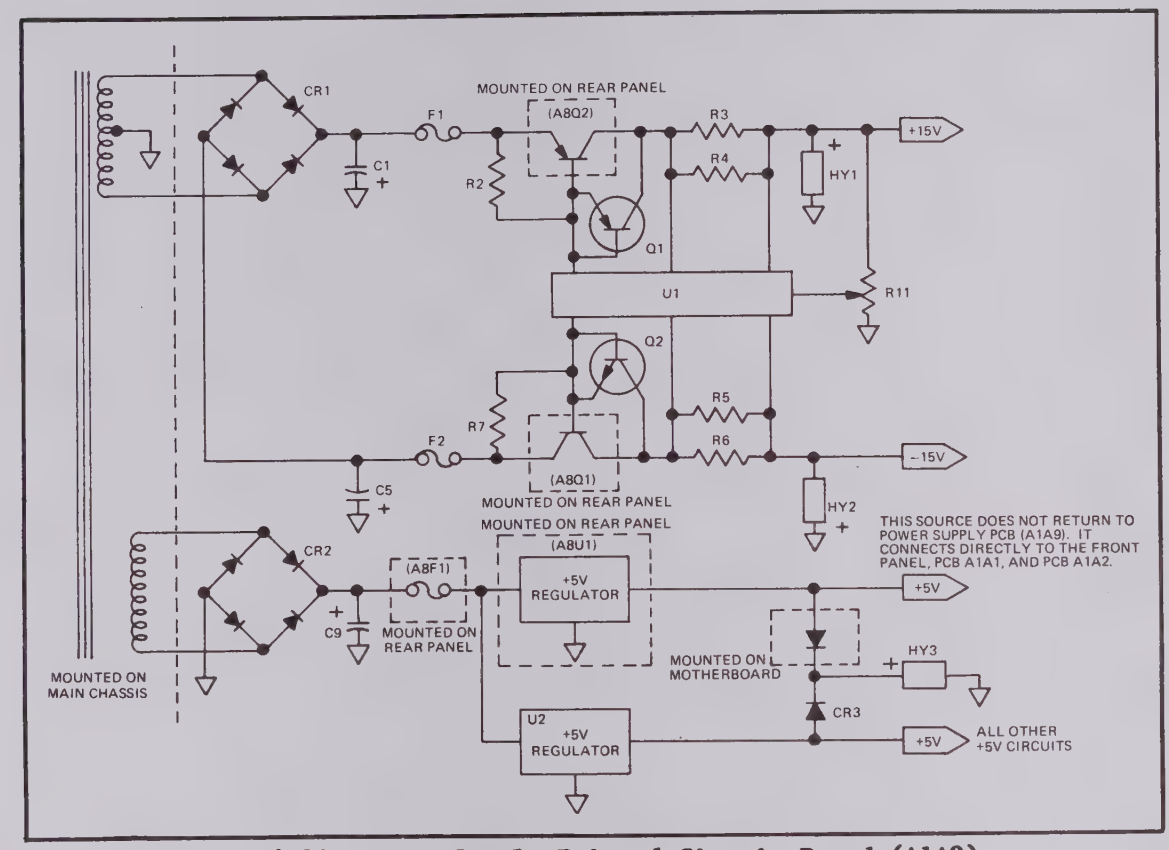

Figure 4-21. Power Supply Printed Circuit Board (A1A9), Block Diagram

4.3.13.2 Hybrids HY1, HY2, and HY3 are crowbar type protective circuits for overvoltage conditions. If either 15 volt supply increases to approximately 17 volts, the corresponding crowbar is activated and the supply source drops to approximately 1.0 volt. The two +5 volt supply sources are similarly protected at approximately 6.2 volts. All crowbars are automatically reset when the ac line voltage is removed. If an overvoltage condition is due to a shorted component or circuit, the crowbar action will blow the corresponding fuse to further protect the power supply.

4.3.14 Precision ±9 Volt Power Supply. A block diagram of the precision ±9 Volt Power Supply, which is part of the Meter and Recorder Interface printed circuit board (A1A6) is shown in Figure 4-22. The precision ±9 volt power supply regulators provide the stable reference sources required for critical sweep tuning and integration circuits. Zener diode CR15 is a 9.0 volt temperature compensated component connected in the feedback loop around amplifier U4A. Current through the zener is held close to the optimum value of 7.5 mA which makes the zener voltage insensitive to temperature changes. Resistors R35 and R36 create a voltage divider circuit which holds the noninverting input of amplifier U4A at 0.5 volt. This makes the junction of diode CR15 and variable resistor R32 approximately +8.5 volts and allows potentiometer R32 to be adjusted over the full tolerance range of diode CR15. This adjustment also regulates the emitter of transmitter Q2 to provide the +9.00 volts output.

4.3.14.1 Resistor R37 is also connected to the +8.5 volt junction and provides the reference input for the -9 volt supply which uses an inverting unity gain amplifier U4B and associated components. Resistors R41 and R42 insure that transistor Q3 is always biased into conduction even if the output of amplifier U4B should increase to +15 volts. This circuit is necessary to insure that diode CR15 can not be forward biased. Resistors R31 and R43 limit the current available to approximately 20 mA for each output, and potentiometer R39 provides the feedback loop adjustment to establish the -9.00 volt output from the emitter of transistor Q3.

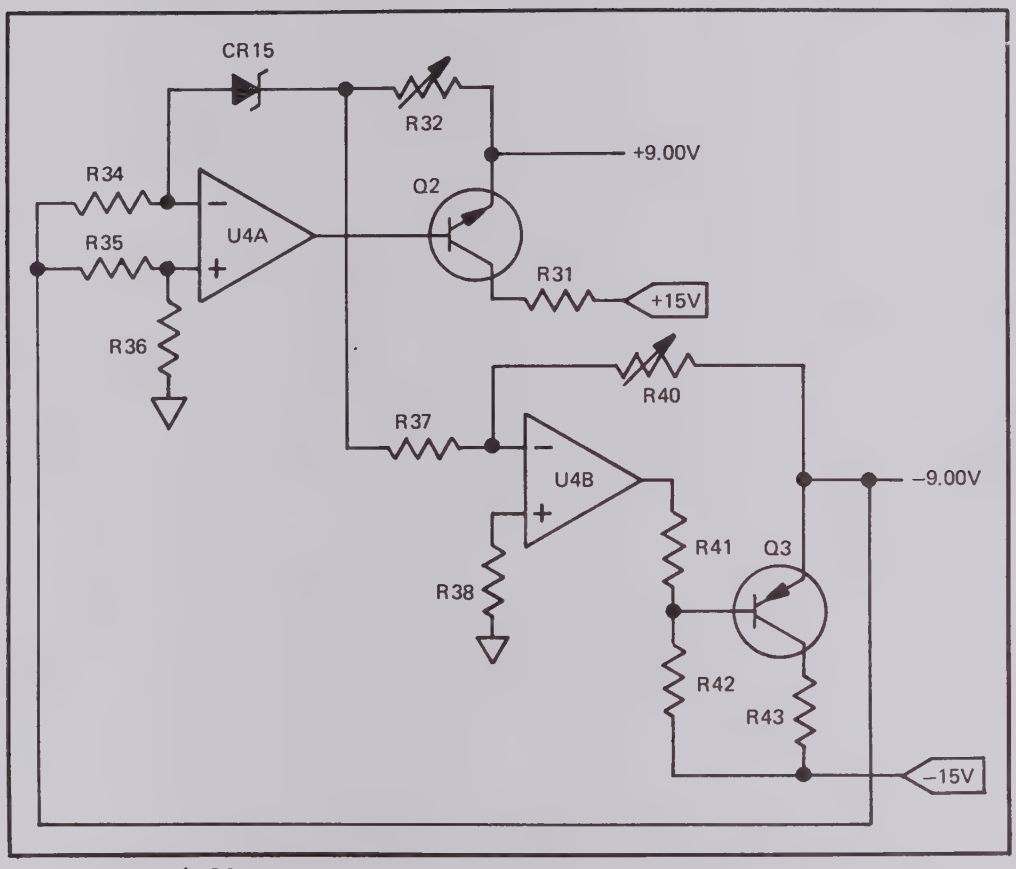

Figure 4-22. Precision ±9 Volt Power Supply, Block Diagram

CHAPTER 5
MAINTENANCE

5.1 GENERAL

5.1.1 Due to the reliability and nature of the equipment, frequent periodic maintenance and alignment of the Scientific-Atlanta Model 4671 IF/Baseband Analyzer is not necessary or recommended. It is recommended, however, that all units be inspected and calibrated by Scientific-Atlanta personnel or representatives on a yearly basis. This action will insure that the instruments will meet all published specifications and provide the user with trouble free, accurate performance. The nearest Scientific-Atlanta representative or the nearest Regional Service Center can arrange for such factory calibration. Regional Service Centers are listed on the last page of this Chapter.

5.2 TEST SPECIFICATIONS—MODEL 4671 IF/BASEBAND ANALYZER

5.2.1 Once the main malfunctioning area has been identified, the individual modules and printed circuit boards may be tested to verify performance by using the following test specifications. Also included is a listing of suggested test equipment.

5.2.2 Suggested Test Equipment. Table 5-1 lists the suggested test equipment necessary to perform the Maintenance Tests in this chapter on the Model 4671 IF/Baseband Analyzer. Equivalent test equipment may be substituted.

Table 5-1
Suggested Test Equipment

(Equivalent test equipment may be used)

A.	Power Supply, HP 6205B adjusted to +15.00 (±.15)V dc and -15.00 (±.15)V dc
B.	Power Supply, HP 6284A
C.	Oscilloscope, Tektronix 475
D.	Signal Generator, Wandel & Goltermann AT-610
E.	Sine/Square Wave generator, HP 3311A
F.	DVM, HP 3465A
G.	True RMS voltmeter, HP 3400A
H.	VHF Signal generator, HP 8640
I.	Power Meter, HP 4354A with HP 8483A (75Ω) power head
J.	Counter, HP 5383A
K.	Selective Level Meter, Wandel & Goltermann AT-611

NOTES:

(1) The reference letters (A through K) will be used in the following paragraphs to refer to specific pieces of test equipment.

(2) Power supplies should have a common return between voltage potentials and the equipment under test chassis. The following paragraphs refer to this common connection as "ground".

5.3 TROUBLESHOOTING—MODEL 4671 IF/BASEBAND ANALYZER

5.3.1 The intent of this section is to enable the technician to repair instruments out of warranty by locating and identifying defective modules or printed circuit boards. Once the defective module or printed circuit board has been isolated, either a pre-tested replacement unit may be obtained from Scientific-Atlanta or further troubleshooting may be performed within the module. It is suggested that prior to troubleshooting within a module or printed circuit board that the technician review thoroughly the applicable section in the Theory of Operation, Chapter 4, and the appropriate schematic.

WARNING

I. There are several circuits which are factory aligned and no attempt should be made to repair or align them in the field. These circuits are listed as follows:

4671 IF/Baseband Analyzer

1. 14 MHz low pass filter in the Baseband Converter (A5)
2. 30 kHz and 1.74 kHz band pass filters in the 302 kHz IF Module (A6)
3. 1.74 kHz band pass filter in the 30 kHz IF Module IA2)

II. All of the printed circuit boards and their connectors in the Model 4671 IF/Baseband Analyzer are keyed so that no board can be inserted in the wrong connector or with the wrong orientation in the correct connector. Of necessity, the extender board provided is not keyed so that it can be used in any board position. When using the extender board, extreme caution must be observed to insure that the board under test is in its proper location and oriented with the components facing toward the front of the instrument.

III. When adjusting the modules after repair or replacement, it will be necessary to orient them horizontally above the other modules to gain access to the adjustments. Place a folder or magazine or similar padding under the module to prevent any electrical shorts to the modules underneath.

5.3.2 The first logical step in troubleshooting the Model 4671 IF/Baseband Analyzer is to localize the problem down to the main function level. There are five main function areas in the Model 4671 IF/Baseband Analyzer: (A) main analog and frequency conversion (A2, A3, A4, A5, A6, A10 and A13), (B) signal processing (A1A1, A1A3, and A1A6), (C) displays and counters (A1A2, A9, A12, and A12A1), (D) automated test sequence circuits (A1A4, A1A5, A7, A7A1, and A9), and (E) power supplies (A1A6, A1A9, and A8). While this listing is not all inclusive, it, along with the overall system block diagram, Figure 4-11, should prove helpful in locating the malfunctioning module or printed circuit board.

5.4 TEST SPECIFICATIONS—MODEL 4671 IF/BASEBAND ANALYZER

5.4.1 Once the main malfunctioning area has been identified, the individual modules and printed circuit boards may be tested to verify performance by using the following test specifications.

5.4.2 Suggested Test Equipment. Refer to Table 5-1 for suggested equipment and notes.

5.4.3 A/D Converter and Arithmetic Printed Circuit Board (A1A1). To properly test this board out of the circuit, a special test fixture must be used. However, the following symptoms would indicate a faulty A1A1 board:

1. Failure of the digital LEVEL -dBm display indicator to illuminate or a fixed 1 or 0 indication which does not change with varying the input level.
2. Failure to indicate the sum of the two attenuators when the front panel ZERO REF switch (A9S1) is depressed even though the analog meter behaves normally while the attenuators are being switched.
3. Any general failure of the digital LEVEL -dBm display coupled with normal behavior of the analog meter.

5.4.4 Counter Printed Circuit Board (A1A2). To properly test this board out of the circuit, a special test fixture must be used. However, the following symptoms would indicate a faulty A1A2 board:

1. Any general failure of the FREQUENCY-kHz display coupled with normal behavior of the analog circuitry.
2. Any unusual flickering of the FREQUENCY-kHz display and the digital LEVEL-dBm display.

5.4.5 Auto Range and Log Amplifier Printed Circuit Board (A1A3). Test equipment required: A, B, E, F, G, and J.

1. Apply +15.00(±0.15)V dc to pins 13 and P.
2. Apply -15.00(±0.15)V dc to pins 10 and L.
3. Apply +5.0(±0.2)V dc to pins K and 9.
4. Ground pins 11, 12, M and N.
5. Inject a 30 kHz (±100 Hz) sinewave signal to pins 1, A at a level of 1.000(±0.001)V RMS.
6. The output at pin Z should be 0.000(±0.005)V RMS and shall decrease linearly within 0.2% at a rate of 0.1V/dB down to a level of 78 dB below 1V RMS.

7. The output at pin Y should be 0.100(±0.001)V dc and should decrease linearly within 0.2% at a rate of 0.1V/dB down to a level of 18 dB below 1V RMS. This signal should return to 0.1V dc as the input signal decreases further and should repeat this cycle with every 18 dB decrease in input until the input is 78 dB below 1V RMS.
8. The outputs as defined in Table 5-2 should occur.

Table 5-2
Auto Range and Log Amplifier Printed Circuit Board (A1A3), Output Levels

dB Below 1V RMS	Pin Number					
	18	19	X	20	21	22
0	0	0	0	0	0	0
12	1	0	0	0	0	0
22	1	1	0	0	0	0
32	1	1	1	0	0	0
42	1	1	1	1	0	0
52	1	1	1	1	1	0
62	1	1	1	1	1	1

NOTE: "0" is 0(±0.2)V dc.
"1" is +5(±0.2)V dc.

9. A pulse should occur at pin 8 each time a 10dB gain section is switched in or out. This pulse should be positive and start at a level of 0.0(±0.2)V dc and go to a level of +5.0(±0.2)V dc. The pulse width should be greater than 0.5 milliseconds.

5.4.6 Sweep Generator and Mode Logic Printed Circuit Board (A1A4). Test equipment required: A, B, E, F, and J.

1. Apply +15.00(±0.15)V dc to pins 13 and P.
2. Apply -15.00(±0.15)V dc tp pin 10.
3. Apply +5.0(±0.2)V dc to pin 9.
4. Apply +9.00(±0.01)V dc to pins 15 and S.
5. Apply -9.00(±0.01)V dc to pins 14 and R.
6. Ground pins 11, and N.
7. The circuitry on the Sweep Generator and Mode Logic Printed Circuit Board (A1A4) is capable of generating a negative slope sweep voltage between the limits of at least 0V dc to -10V dc. The sweep times are selectable by the logic inputs as defined in Table 5-3 and are:

   45(±4.5) seconds
   70(±7) seconds
   180(±18) seconds
   10.0(±1.0) minutes
   20.0(±4.0) seconds

   as measured at test point TP1. The voltage level at test point TP1 should be between 0(±10)mV dc and -10.00 (±0.02)V dc. The retrace time of the sweep voltage at test point TP1 should be less than 0.1 second in all baseband sweep modes and should be less than 10 seconds in all IF sweep modes.
8. The circuitry should provide logical operations to produce the functions defined in Table 5-3.
9. Test condition for NPR Retrace listed in Table 5-2. After 10 seconds, let the NPR Retrace input (pin J) go to a "0" condition. Note that the scan voltage at TP1 reverses direction and maintains a rate of greater than 0.5 volts/second. Note also that the pen drop output (pin D) goes to a low state.

Table 5-3
Sweep Generator and Mode Logic Printed Circuit Board (A1A4), Output Functions

Conditions									
Input Function	**Pin Number**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
BB Mode	1	X	X	1	1	1	0	0	0
±35 MHz	2	X	X	0	0	0	1	0	0
±25 MHz	4	X	X	0	0	0	0	1	0
BB Response	A	X	X	1	0	0	0	0	0
Tone Search	B	X	X	0	1	0	0	0	0
Record	C	0	1	X	X	X	X	X	X
Sweep On	20	X	X	1	1	1	1	1	1
NPR Retrace	J	1	1	1	1	1	1	1	1
NPR Slow Scan	19	1	1	1	1	1	1	1	1
Output Function									
Sweep Time (Seconds)	TP1	X	X	45	180	45	70	45	45
Retrace Time (Seconds)	TP1	X	X	<.1	<.1	<.1	>20	>20	>20
Pen Drop	D	1	0	X	X	X	X	X	X
(NPR + (Tone Search)	6	X	X	0	1	1	0	X	X
±5 MHz	3	X	X	X	X	0	0	0	1
End of Search (Pulse)	H	X	X	1	1	1	1	1	1

NOTES:

1. A "0" is an open circuit.
2. A "1" is a +5(±0.2)V dc level.
3. A "X" is a don't care condition.
4. The end of sweep is a narrow pules from 0 to +5V dc whose width is at least 24 microseconds, with pin H tied to +5V dc through a 2.2 K ohm resistor.
5. The pen drop output should be measured with pin D tied to +5V dc through a 2.2 K ohm resistor.
6. A time delay should exist from the moment the sweep on signal at pin 20 is applied to time the sweep voltage at TP1 starts to ramp down. This delay should be 0.3(±0.15) seconds.

10. Test condition for NPR Slow Scan listed in Table 5-2. After 10 seconds, let the NPR Slow Scan input (pin 19) go to a low state. Note that the scan voltage at TP1 changes from a rate of approximately 0.2 volts/second to a rate of approximately 1 volt/minute.
11. The dc gain and bias tests require the following procedure:
    A. Apply +5.0(±0.2)V dc to pins 1, 7, 8, J, and 19.
    B. Apply 0.0(±0.1)V dc to pins 2, 4, A, B, C, F and 20.
    C. Measure the voltage at TP2 to be -1.00(±0.05)V dc.
    D. Change the voltage applied at pin 7 to 0.0(±0.1)V dc.
    E. Measure the voltage at TP2 to be +0.475(±0.07)V dc.
    F. Return the voltage applied at pin 7 to +5.0(±0.2)V dc. Connect a 1.0 megohm (±1 percent) resistor between TP2 and TP3. Change the voltage applied at pin 22 to +0.500(±0.005)V dc. Now, for each set of input test conditions specified in Table 5-4, measure and verify the respective voltage at pin 7.

Table 5-4
Sweep Generator and Mode Logic Printed Circuit Board (A1A4), Bias Limits

Input Pin	Test Conditions					
	1	2	3	4	5	6
1	1	1	1	1	0	0
4	0	0	0	0	0	1
A	1	1	1	1	0	0
E	0	0	0	1	0	0
Y	0	0	1	0	0	0
21	0	1	0	0	0	0
Output Voltage at Pin Z	-1.0 (±0.03) V dc	-1.156 (±0.04) V dc	-4.68 (±0.12) V dc	-9.88 (±0.30) V dc	-1.32 (±0.04) V dc	-6.61 (±0.20) V dc

NOTES: 1. Pins 2, 4, C and 20 are at a low logic state and pins J, 19, 7, 8, and F are at a high logic state for all test conditions.

12. Remove the 1.0 megohm resistor connected between TP2 and TP3. Repeat Step 11 to establish Test Condition 1 listed in Table 5.3. The gain between TP2 and VCO control output pin Z should be:
    A. at dc greater than 300
    B. at 1.59 Hz the gain is 3(±0.3)
    C. slope between dc and 1.59 Hz - 6 dB per octave
    D. at 100 Hz the gain is 4.62(±0.5)

5.4.7 Scan Control Printed Circuit Board (A1A5) Test equipment required: A, B, C, F, and J.

1. Apply +15.00(±0.15)V dc to pin 13.
2. Apply -15.00(±0.15)V dc to pin 10.
3. Apply +5.0(±0.2)V dc to pin 9.
4. Apply +9.00(±0.01)V dc to pin 15.
5. Apply -9.00(±0.01)V dc to pins 14 and R.
6. Ground pins 11 and N.
7. The circuitry should generate a 500.000(±1.0) kHz square wave output at an amplitude from 0.2(±0.2)V dc to +5.0 (±0.5)V dc level at pin F.
8. With a square wave input to pin 5 whose amplitude is between the levels of 0.2(±0.2)V dc and +5.0(±0.5)V dc and whose frequency is variable between 3.000 and 4.250 MHz. The output at pin 21 and pin 22 should be within the limits as specified in Table 5.5 and should vary linearly within 0.25% as the input frequency is varied between the specified limits.

5.4.8 Meter/Recorder Interface Printed Circuit Board (A1A6). Test equipment required: A, B, C, E, F, and J.

1. Apply +15.00(±0.15)V dc to pins 13 and P.
2. Apply -15.00(±0.15)V dc to pins 10 and L.
3. Apply +5.0(±0.2)V dc to pins 9 and K.

Table 5-5
Scan Control Printed Circuit Board (A1A5), Limits

Control Input Pins							Lower Frequency Limit	Adjust Listed Pot. For 0.000 (±0.002) V dc at Pin 21	Upper Frequency Limit	Adjust Listed Pot. For 10.00 (±0.01) V dc at Pin 21
17	19	20	18	4	3	2				
1	0	0	0	0	0	0	3.5833 MHz	R18	3.7500 MHz	R20
0	1	0	0	0	0	0	3.2500 MHz	R23	4.0833 MHz	R26
0	0	1	0	0	0	0	3.0833 MHz	R29	4.1250 MHz	R32
0	0	0	1	0	0	0	3.0050 MHz	R58	3.0750 MHz	R62
0	0	0	0	1	0	0	3.0050 MHz	R49	3.1500 MHz	R52
0	0	0	0	0	1	0	3.0050 MHz	R42	3.600 MHz	R45
0	0	0	0	0	0	1	3.0050 MHz	R36	4.125 MHz	R39

NOTES:

1. A "0" is a dc level of 0.1(±0.1)V dc.
2. A "1" is a dc level of 5.0(±0.2)V dc.
3. The voltage at pin 22 shall be the same as that specified for pin 21 but the tolerance shall be 0.00(±0.05)V dc for the lower frequency limit and 10.00 (±0.10)V dc for the upper frequency limit.
4. A slight interaction between the bias potentiometer (lower limit adjustment) and the respective gain potentiometer (upper limit adjustment) may exist. To minimize this, adjust the bias potentiometer first and then the gain potentiometer for each step. Repeat this procedure until the circuit is in specification.

4. Ground pins 11, 12, M and N.
5. With pins U, V, and W open circuited and pin X applied to +5V dc, the gain from pin Y to pin Z under no load should be 1(±4%) at dc signals between 0 and -8 volts and should be 6 dB down at a frequency of 74(±8) Hz at 1 volt peak-to-peak.
6. With pins U, V, W, and X open circuited, the gain from pin Y to pin Z under no load should be 1(±4%) at dc signals between 0 and -8 volts and should be 3 dB down at a frequency of 7.5(±1) Hz at 1 volt peak-to-peak.
7. With +5V applied to pins U and W, and with pins V and X open circuited, the gain from pin Y to pin Z should be nominally 7.3 (adjusted by R14) under no load conditions at dc signals between 0 and -1 volt and should be 3 dB down at a frequency of 0.95(±0.2) Hz at 0.15 volts peak-to-peak. With the output pin Z terminated in a 1.63 K ohm(±1%) resistor the gain at dc between pin Y and pin Z should be .74(±10%).
8. With pins U, V, W, and X open circuited and with the input voltage applied to pin Y set to yield 0.000(±0.001)V dc at TP2, the current between pin T and ground should be adjustable from at least +90 to -90 microamps, by varying resistor R18. With R18 set for 0(±10) microamps between pin T and ground, apply -7.50(±0.01)V dc to input pin Y. The current between pin T and ground should be 1 milliamp as adjusted by resistor R15.
9. With -1.000(±0.001)V dc applied to pin Y for a least 1 second, apply +5 volts to pin V. The voltage at TP1 should decrease from +1.00(±0.02)V dc at a rate slower than 1 volt/second.
10. With pins U, V and W open circuited, pin X connected to +5.0V dc, and an input signal waveform as shown in Figure 5-1A applied to pin Y, the output signal at pin Z should be within the limits as shown in Figure 5-1B.

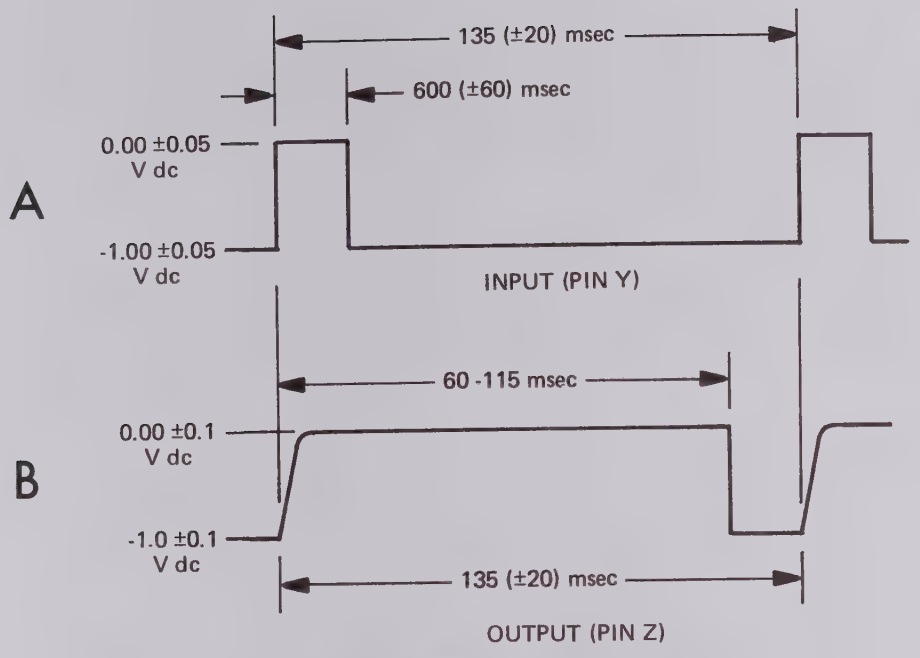

Figure 5-1. Test Waveforms for Meter/Recorder Interface Printed Circuit Board (A1A6)

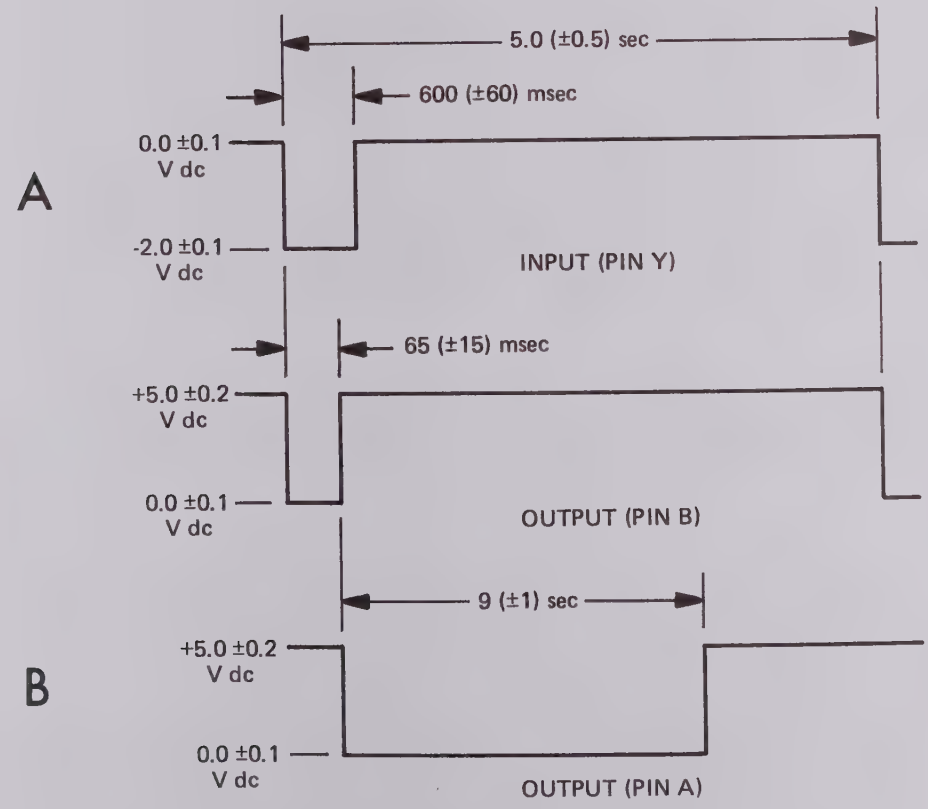

Figure 5-2. Control Waveforms for Meter/Recorder Interface Printed Circuit Board (A1A6)

11. Adjust variable resistor R40 for -9.000(±0.003)V dc as measured at pin 14.
12. Adjust variable resistor R32 for +9.000(±0.003)V dc as measured at pin 15.
13. With pins C, U, V and W open circuited, +5.0(±0.2)V dc applied to pins D, E and X, and an input signal waveform as shown in Figure 5-2A applied to pin Y, the output signals at pins A and B should be within the limits as shown in Figure 5-2B.
14. With the inputs applied as described in Step 13, note that the output signals at pins A and B go to a level of +5.0(±0.2)V dc when the following control lines are changed one at a time.
    A. Change pin C from an open circuit to +5.0(±0.2)V dc and then return to original open circuit.
    B. Change pin D from +5.0(±0.2)V dc to an open circuit and then return to original +5.0V dc level.
    C. Change pin E from +5.0(±0.2)V dc to an open circuit and then return to original +5.0V dc level.

5.4.9 Power Supply Printed Circuit Board (A1A9). Test equipment required: B, C, F, and two external ac supplies such as Variacs and assorted power resistors for loading.

(All voltages and currents are referenced to ground on pins 12 and N. Power supply ground, pins 12 and N, is connected to chassis ground, pins 21, 22, Y, and Z externally.)

1. Connect the external series pass transistors as shown by dashed lines on the schematic shown in Figure 7-48.
2. Apply a 36V ac center tapped source to pins 17 and 18. Apply a 10V ac source to pins 4 and 5.
3. Connect an adjustable resistive load (approximately 12.5 ohms) to pin 13 and adjust it to draw 1.2(±0.1)A. Connect an adjustable resistive load (approximately 18.75 ohms) to pin 10 and adjust it to draw -0.8(±0.1)A.

4. The voltage at pin 13 should read +15.00(±0.15)V dc. AC ripple should be less than 20mV. The voltage at pin 10 should read -15.00(±0.15)V dc. AC ripple should be less than 20mV.
5. Increase the load on pin 13 until 1.6(±0.1)A is drawn. The voltage should drop from its nominal +15V value, indicating that the +15V current limit is operating properly. Decrease the load to 1A.
6. Increase the load on pin 11 until 1.1(±0.1)A is drawn. The voltage should rise from its nominal -15V value, indicating that the -15V current limit is operating properly. Remove the resistive loads from pins 10 and 13.
7. Connect an adjustable 10 ohms resistive load to pin 9 and adjust it to draw 0.5(±0.1)A. The voltage at pin 9 should read 5.0(±0.2)V dc. Remove the resistive load from pin 10. Remove all ac input power.
8. Connect a current limited external dc power supply to pin 13. Adjust the current limit to 1(±0.5)A. Increase the voltage from 0V until the overvoltage circuit "trips". The trip point should be 17.00(±0.85)V dc.
9. Repeat step "8" but reverse the polarity from pin 10. The trip point specification is the same.
10. Repeat step "8" for pin 16. The trip point should be 6.2 (±0.31)V dc.

5.4.10 30 kHz IF Module (A2). Test equipment required: A, B, E, G, and J.

1. Apply +15.00(±0.15)V dc to pin 11 or 16 of J3.
2. Apply -15.00(±0.15)V dc to pin 12 or 15 of J3.
3. Apply +5.0(±0.2)V dc to pin 2 or 25 of J3.
4. Apply a 30 kHz(±100Hz) at .707(±0.01)V rms sine wave signal to J1. The output at J2 should be 1.00V(±0.01) dB.

5. Decrease the 30 kHz signal at J1 by 1.0 dB. Apply +5V dc to pin 3 of J3. The output at J2 should be 1.00V(±0.1) dB. Remove the +5V dc at pin 3 of J3.
6. Decrease the 30 kHz signal at J1 by 2.0 dB from Step 4. Apply +5V dc to pin 1 of J3. The output at J2 should be 1.00(±0.1) dB. Remove the +5V dc at pin 1 of J3.
7. Decrease the 30 kHz signal at J1 by 3.0 dB from Step 4. Apply +5V dc to pins 1 and 3 of J3. The output at J2 should be 1.00(±0.1) dB. Remove the +5V dc at pins 1 and 3 of J3.
8. Decrease the 30 kHz signal at J1 by 4.0 dB from Step 4. Apply +5V dc to pin 5 of J3. The output at J2 should be 1.00V(±0.05) dB. Remove the +5V dc at pin 5 of J3.
9. Decrease the 30 kHz signal at J1 by 8.0 dB from Step 4. Apply +5V dc to pin 6 of J3. The output at J2 should be 1.00V(±0.05) dB. Remove the +5V dc at pin 6 of J3.
10. Decrease the 30 kHz signal at J1 by 10.0 dB from Step 4. Apply +5V dc to pin 8 of J3. The output at J2 should be 1.00V(±0.05) dB. Remove the +5V dc at pin 8 of J3.
11. Decrease the 30 kHz signal at J1 by 20.0 dB from Step 4. Apply +5V dc to pin 7 of J3. The output at J2 should be 1.00V(±0.05) dB. Remove the +5V dc at pin 7 of J3.
12. Decrease the 30 kHz signal at J1 by 40.0 dB from Step 4. Apply +5V dc to pin 13 of J3. The output at J2 should be 1.00V(±0.05) dB. Remove the +5V dc at pin B of J3.
13. Increase the 30 kHz signal at J1 to the level in Step 4. Vary the frequency of the input signal from 15 to 45 kHz. The output at J2 should vary only ±.1 dB over that frequency range. Vary the frequency of the input signal from 45 to 110 kHz. The 3 dB rooloff at J2 should occur between 85 and 105 kHz.

14. Apply +5V dc to pin 10 of J3 (selects narrowband mode). Using the same amplitude as in Step 13, vary the frequency of the signal at J1 from 15 to 45 kHz. The 3 dB bandwidth should be typically 1.8 kHz. Apply 30 kHz to J1. The output should be 1.00V rms ±0.1 dB.

5.4.11 IF Local Oscillator Module (A3). Test equipment required: A, B, C, G, I, and J.

1. Apply +15.00(±0.15)V dc to feedthrough capacitor C14.
2. Apply -15.00(±0.15)V dc to feedthrough capacitor C15.
3. Apply +5.0(±0.2)V dc to feedthrough capacitor C13.
4. Inject a 0 dBm signal at 30.833 Hz in J1. Connect a counter to J2. Vary the frequency of the injected signal from 30.833 to 42.5 MHz. The counter should indicate from 185 to 255 MHz while varying the injected frequency.
5. Connect a power meter to J2. Vary the injected frequency from 30.822 to 42.5 MHz. The output power should be +4 dBm or greater with a peak-to-peak variation of less than ±1 dB.
6. Connect a counter to J3. Vary the injected signal from 30.0 to 42.5 MHz. The frequency of the signal at J3 should be the injected signal divided by 10.

5.4.12 IF Converter Module (A4). Test equipment required: A, H, and I.

1. Apply +15.00(±0.15)V dc to feedthrough capacitor C32.
2. Apply -15.00(±0.15)V dc to feedthrough capacitor C33.
3. Inject a +5 dBm 220.000 MHz CW signal into J2. Inject a -20 dBm 70 MHz CW signal into J1. Power output at J3 should be -19.5 dBm.

4. Vary the signal at J2 from 185 to 255 MHz while varying the signal at J1 from 35 to 105 MHz (at all times maintaining a 150 MHz separation between the two signals.) Power output at J3 should not vary more than ±0.5 dB.
5. Inject a +5 dBm 220.000 MHz CW signal into J2. Inject a a -17 dBm 70 MHz CW signal into J1. The voltage at feedthrough capacitor C31 (overload signal) should be at its high state (typically +4.5V). Change the level of the 70 MHz signal to -18 dBm. The voltage at C31 should now be at its low state (typically 0V).

5.4.13 Baseband Converter Module (A5). Test equipment required: A, D, G, H, I, and J.

1. Apply +15.00(±0.15)V dc to feedthrough capacitor C39.
2. Apply -15.00(±0.15)V dc to feedthrough capacitor C40.
3. Inject a +6 dBm 31.000 MHz CW signal into J2. Inject a -20 dBm 1.000 MHz CW signal into J1. Ground feedthrough capacitor C1. The output at J5 should be 302.7 kHz at a level of -17 dBm(±1)dB.
4. Inject a -19.5 dBm 30.0 MHz CW signal into J3. Apply +5V to feedthrough capacitor C1. The output at J5 as read on a TRUE RMS voltmeter should be between 0.891V and 1.122V.

5.4.14 302 kHz IF Module (A6). Test equipment required: A, B, E, G, and J.

1. Apply +15.00(±0.15)V dc to feedthrough capacitor C2.
2. Apply -15.00(±0.15)V dc to feedthrough capacitor C1.
3. Ground feedthrough capacitor C4 (selects wideband operation).
4. Connect a signal generator to J1. Adjust its output for 302.727...kHz at 1.00V RMS.
5. Connect a true RMS voltmeter to J2. The output should read between 0.98V and 1.02V RMS.

6. Vary the signal at J1 between 280 and 320 kHz. The 3 dB bandwidth should be 30.00(±3.00) kHz.
7. Remove ground from feedthrough capacitor C4. Apply +5 (±0.5)V to the point (selects narrow band operation).
8. Repeat Step 4 and 5.
9. Vary the signal at J1 between 298 and 307 kHz. The 3 dB bandwidth should be 2.32 kHz (±232 Hz).

5.4.15 Lamp Logic Printed Circuit Board (A7). The following symptoms would indicate a faulty Lamp Logic board:

1. Any failure in the MANUAL, AUTO or RECORD test sequence such as failure to remain latched or wrong chain of events, etc.
2. Failure of the lamp to light other than burned out lamp or interlock problem (see paragraph 5.3.16).

Lamps are user replaceable by merely pulling the lamp from its socket and inserting a new lamp. No soldering is necessary.

5.4.16 Interlock Logic Printed Circuit Board (A7A1). Test equipment: G. The following symptoms would indicate a faulty Interlock Logic Board:

1. Depress the following switches one at a time: BB RESPONSE, NPR, TONE SEARCH, IF, ±5 MHz, ±25 MHz, ±35 MHz. Only the lamp above the depressed switch should light. If a lamp fials to light, check the appropriate output on jack J1. A 5.0(±.5)V dc level should cause the lamp to light, 0V dc should cause it to extinguish. If the correct level is observed at J1, the trouble is either a burned out lamp or a problem on the Lamp Logic Printed Circuit Board (A7).

5.4.17 De-Emphasis Network Module (A10). If the frequency response of the De-Emphasis Network is suspected, make a back-to-back test with the Model 4660 Baseband Noise Transmitter with pre- and de-emphasis. If those results appear normal, try substituting a known good Western Electric Model 4208B de-emphasis network. If the results now appear normal, the internal A10 De-Emphasis Network is at fault.

5.4.18 Attenuator Logic Printed Circuit Board (A11). Test equipment required: None (this board is tested while installed in the Model 4671 IF/Baseband Analyzer).

1. Set the INPUT attenuator to +10 dB and the REFERENCE attenuator to 0 dB.
2. Turn the ac power on.
3. While depressing the ZERO REF switch (A9S1), switch the INPUT attenuator down in 1 dB steps. The digital level meter should also decrease in 1 dB steps.
4. Once -20 dB is reached on the INPUT attenuator, begin switching the REFERENCE attenuator down in 1 dB steps. Here, again, the digital level meter should decrease in 1 dB steps.
5. At all times the level indicates on the digital level meter should be the algebraic sum of the two attenuators.

5.4.19 Digital Interface Printed Circuit Board (A12) and Display Printed Circuit Board (A12A1). Test equipment required: None (these boards are tested while installed in Model 4671 IF/ Baseband Analyzer).

1. Turn the ac power on.
2. Depress the lamp test switch, A12S1, located along the top edge of the Digital Interface board. All of the LED display segments should light.

3. Set the INPUT and REFERENCE attenuators to 0 dB. Depress the BB RESPONSE switch. Make sure the input to the instrument is open-circuited. The decimal points in the LEVEL - dBm display should flash.
4. Tune the frequency below 0 kHz. The decimal points in the FREQUENCY - kHz display should flash.

5.4.20 Baseband Local Oscillator Module (A13). Test equipment required: A, B, G, J, and R.

1. Apply +15.00(±0.15)V dc to feedthrough capacitor C35.
2. Apply -15.00(±0.15)V dc to feedthrough capacitor C37.
3. Ground feedthrough capacitor C36.
4. Manually tune from the lower extreme to the upper extreme with the counter connected to J1 and the power meter connected to J2. The frequency should vary smoothly from less than 30 MHz to greater than 42.5 MHz. The power output from J2 should be 0 dBm (±0.25) dB.
5. Repeat Step 4 with the power meter connected to J1 and the counter connected to J2. The power output from J1 should be between +5.0 dBm to +6.25 dBm.
6. Apply +5V dc to feedthrough capacitor C36 (selects AUTO mode).
7. Apply -12V dc to J4. Connect the counter to J1 and the power meter to J2. The frequency at J1 should be greater than 42.5 MHz.
8. Apply +13V dc to J4. The frequency at J1 should be less than 30 MHz.

5.5 MODULE AND PRINTED CIRCUIT BOARD REPLACEMENT FOR MODEL 4671 IF/BASEBAND ANALYZER

Once the defective module or printed circuit board has been isolated, a pre-tested replacement unit can be easily installed with only a few required adjustments.

WARNING

I. When using the extender board to allow easy adjustment of a replacement printed circuit board, be sure that the printed circuit board is inserted into the proper connector and that the components on the printed circuit board face toward the front of the equipment.

II. When making adjustments to the modules, it will be necessary to lay them on top of the other modules. Be sure to place a folder or magazine under the module so that it will not short out the modules below.

Table 5-6 outlines the necessary adjustments for each module or printed circuit board. Unless otherwise specified, the "Input" column refers to the signal applied to the front panel 75Ω IN IF/BB connector.

Table 5-6
Replacement Adjustments

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A1A1 A/D Converter & Arithmetic Assy.	No Adjustments			
A1A2 Counter	No Adjustments			
A1A3 Autorange & Log Amp.	No Adjustments			
A1A4 Sweep Gen. & Mode Logic	A1A4R42	Adjust R42 so that the scan of the recorder is within ±1/3 divisions of the right hand end of the chart (12.5 MHz).	1. Connect Model 4673 X-Y Recorder. 2. Use chart paper No. 214. 3. Depress NPR and MANUAL. 4. Adjust FREQ to 1000 kHz. 5. Adjust X-Axis to zero to place pen over 1 MHz grid. 6. Depress AUTO and RECORD switches.	N/A

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A1A5 Scan Control	1. A1A5R36	50(±1)kHz on freq display	Set BASEBAND SCAN switch to 12.5 MHz.	
	2. A1A5R39	10.00(±0.01)V dc on A1A5TP5	Depress BB RESPONSE and AUTO switches.	N/A
			Depress BB RESPONSE and MANUAL switches. Tune to 12,500 kHz.	N/A
	3. A1A5R42	50(±1)kHz on freq display	Set BASEBAND SCAN switch to 6.0 MHz.	
	4. A1A5R48	10.00(±0.01)V dc on A1A5TP5	Depress BB RESPONSE and AUTO switches.	N/A
			Depress BB RESPONSE and MANUAL switches. Tune to 6,000 kHz.	N/A
	5. A1A5R49	50(±1)kHz on freq display	Set BASEBAND SCAN switch to 1.5 MHz.	
	6. A1A5R52	10.00(±0.01)V dc on A1A5TP5	Depress BB RESPONSE and AUTO switches.	N/A
			Depress BB RESPONSE and MANUAL switches. Tune to 1,500 kHz.	N/A

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A1A5 Scan Control - continued	7. A1A5R58	50(±1)kHz on freq display	Set BASEBAND SCAN switch to .75 MHz.	
	8. A1A5R62	35.00(±0.01)V dc on A1A5TP5	Depress BB RESPONSE and AUTO switches.	N/A
			Depress BB RESPONSE and MANUAL switches. Tune to 750 kHz.	N/A
	9. A1A5R29	35.00(±0.01)MHz on freq display	Depress 70 ±35 MHz and AUTO switches.	N/A
	10. A1A5R31	10.00(±0.01)V dc on A1A5TP5	Depress 70 ±35 MHz and MANUAL switches. Tune to 105,000 kHz.	N/A
	11. A1A5R23	45.00(±0.01)MHz on freq display	Depress 70 ±25 MHz and AUTO switches.	N/A
	12. A1A5R26	10.00(±0.01)V dc on A1A5TP5	Depress 70 ±25 MHz and MANUAL switches. Tune to 95,000 kHz.	N/A
	13. A1A5R18	65.00(±0.01)MHz on freq display	Depress 70 ±5 MHz and AUTO switches.	N/A

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A1A5 Scan Control - continued	14. A1A5R21	10.00(±0.01)V dc on A1A5TP5	Depress 70 ±5 MHz and MANUAL switches. Tune to 75,000 kHz.	N/A
	15. X-AXIS GAIN Potentiometer on Rear Panel		a. Connect Model 4673 X-Y Recorder. b. Depress MANUAL and NPR switches. c. Adjust frequency to 1 MHz and adjust recorder to place pen over 1 MHz grid. (Chart paper No. 214). d. Manually tune to 12.5 MHz and adjust X-Axis gain pot so that the pen is over the right hand end of the chart (12.5 MHz). e. Repeat c and d as necessary.	N/A
A1A6 Meter & Recorder Interface	1. A1A6R40	-9.000(±0.002)V dc at pins 14, R on A1A6 board.	N/A	N/A
	2. A1A6R32	+9.000(±0.002)V dc at pins 15, S on A1A6 board.	N/A	N/A

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A1A6 Meter & Recorder Interface - continued	3. A1A6R18	+3 dB indication on the analog meter	a. Depress NPR and MANUAL switches. b. Adjust frequency to peak on input signal (1 MHz).	+3.00 dBm(±0.01 dB), 1 MHz CW signal.
	4. A1A6R15	-30 dB indication on the analog meter	a. Depress NPR and MANUAL switches. b. Adjust frequency to peak on input signal (1 MHz).	-30.00 dBm(±0.01 dB), 1 MHz CW signal.
	5. A1A6R14	-2 dB indication on the analog meter	a. Depress BB RESPONSE and MANUAL switches. b. Adjust frequency to peak on input signal (1 MHz).	-2.00 dBm (±0.01 dB), 1 MHz CW signal.
	6. Y-Axis Gain Potentiometer on Rear Panel		a. Connect Model 4673 X-Y Recorder b. Depress MANUAL and NPR switches. c. Adjust frequency to peak on input signal. Adjust recorder to place pen over 0 dBm grid. (Chart paper No 214). d. Adjust Y-Axis gain pot so that the pen is now over the -40 dBm grid. e. Repeat c and d as necessary.	a. N/A b. N/A c. 0 dBm(±0.01 dB), 1 MHz CW signal. d. -40.00 dBm (±0.01 dB), 1 MHz CW signal.

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A1A9 Power Supply	A1A9R11	Adjust R11 so that the +15V and -15V supplies are symmetrically spaced about the value 15 volts.		N/A
A2 30 kHz IF Module	1. A2R33	0.0 dBm (±0.1 dB) on digital LEVEL - dBm display.	a. Depress NPR and MANUAL switches. b. Adjust frequency to peak on input signal (1 MHz).	0.00 dBm (±0.01 dB), 1 MHz CW signal.
	2. A2R37	0.0 dBm (±0.1 dB) on digital LEVEL - dBm display.	a. Depress BB RESPONSE and MANUAL switches. b. Adjust frequency to peak on input signal (1 MHz).	Same as above
A3 IF LO Module	No Adjustments			
A4 IF Converter Module	1. A4R33	0.0 dBm (±0.1 dB) on digital LEVEL - dBm display.	a. Depress 70 ±35 MHz and manual switches. b. Adjust frequency to peak on input signal (70 MHz).	0.0 dBm (±0.1 dB), 70 MHz CW signal.

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A4 IF Converter Module - continued	2. A4R19	Overload indication at -17 dBm (flashing decimals).	a. Depress 70 ±35 MHz and manual switches. b. Reduce input signal 1 dB. Decimals should stop flashing.	-17 dBm, 70 MHz CW signal.
A5 Baseband Converter Module	1. A5R9	0.0 dBm (±0.1 dB) on digital LEVEL - dBm display.	a. Depress MANUAL and NPR switches. b. Adjust frequency to peak on input signal, (1 MHz).	0.00 dBm (±0.01 dB), 1 MHz CW signal.
	2. A5R49	Overload indication at +3.7 dBm (flashing decimals).	a. Depress MANUAL and BB RESPONSE switches. b. Adjust frequency to peak on input signal (1 MHz). c. Reduce input signal to +3.6 dBm. Decimals should stop flashing.	+3.70 dBm (±.01 dB), 1 MHz CW signal.
A6 302 kHz IF Module	1. A6R19	0.0 dBm (±0.1 dB) on digital LEVEL - dBm display.	a. Depress MANUAL and NPR switches. b. Adjust frequency to peak on input signal (1 MHz).	0.00 dBm (±0.01 dB), 1 MHz CW signal.

Table 5-6
Replacement Adjustments (continued)

PCB or Module Name	Adjust	For	Adjustment Conditions	Input
A6 302 kHz IF Module - continued	2. A6R21	0.0 dB (±0.1 dB) on digital LEVEL - dBm display.	a. Depress MANUAL and BB RESPONSE switches. b. Adjust frequency to peak on input signal (1 MHz).	0.0 dBm (±0.01 dB), 1 MHz CW signal.
A7 Lamp Logic Printed Circuit Board	No Adjustments			
A7A1 Interlock Logic Printed Circuit Board	No Adjustments			
A11 Attenuator Logic Module	No Adjustments			
A12 Display Printed Circuit Boards	No Adjustments			
A13 Baseband LO Module	Perform Steps 1 through 5 for A1A5 Printed Circuit Board.			

5.6 REGIONAL SERVICE CENTERS

5.6.1 Regional Service Centers capable of performing periodic maintenance and providing assistance associated with the Model 4671 IF/Baseband Analyzer and other Scientific-Atlanta equipment are listed below: Service Assistance for areas not listed can be provided through Scientific-Atlanta Field Service Center, 4025 Pleasantdale Road, Atlanta, Georgia 30340; TEL: 404-441-4200; TWX: 810-766-4912; TELEX: 0542898.

NORTH AMERICAN REGIONAL SERVICE CENTERS

Northeastern Regional Office
149 Middlesex Turnpike
Burlington, Massachusetts 01803
Tel: 617-272-1256

Washington D.C. Regional Office
Washington Business Park
5100-J Philadelphia Way
Tanham, Maryland 20706
Tel: 301-577-4830

Mid Atlantic Regional Office
2100 Route 208
Fair Lawn, New Jersey 07410
Tel: 201-791-8777

Southeastern Regional Office
4025 Pleasantdale Road
Atlanta Georgia 30340
Tel: 404-449-2021

Florida Regional Office
P.O. Box 2143
841 West Emmett St.
Kissimmee, Florida 32741
Tel: 305-846-0055

Midwest Regional Office
Fidelity Bldg., Suite 306
11550 N. Meridian
Carmel, Indiana 46032
Tel: 317-846-7142

Southwestern Regional Office
1237 Executive Drive, East
Richardson, Texas 75081
Tel: 214-238-1116

So. California Regional Office
P.O. Box 2668
10039 Pioneer Boulevard
Santa Fe Springs, California 90670
Tel: 213-949-9411

No. California Regional Office
3375 Scott Boulevard, Suite 304
Santa Clara, California 95051
Tel: 408-496-1040

INTERNATIONAL SERVICE CENTERS

CANADA
Scientific-Atlanta, Ltd.
1640 Bonhill Road
Unit 6
Mississauga, Ontario L5T1C8
Tel: 416-677-6555
Telex: 06983600

GERMANY
Scientific-Atlanta GmbH
Albert Schweitzerstrasse 66/3
D-8000 Munich 83, Germany
Tel: 49.8967.1091
Telex: 5212264

ENGLAND
Scientific-Atlanta, Ltd.
Horton Manor
Stanwell Road
Horton
Slough SL3 9PA, England
Tel: 44.2812-3211
Telex: 849406

ITALY
Scientific-Atlanta, S.p.A.
Via Benedetto Croce 19
00142 Rome, Italy
Tel: 39.6.5420244
Telex: 721441

FRANCE
Scientific-Atlanta S.A.
4 Avenue Gabriel Peri
78360 Montesson
France
Tel: 33.3.9769191
Telex: #46385

CHAPTER 6
PARTS LISTS

6.1 GENERAL

The parts list for the Model 4671 IF/Baseband Analyzer is included in this Chapter. Special modifications, if any, will be found in the envelope in the back of this manual.

6.2 EXPLANATION OF COLUMN HEADINGS

Ref. Desig.
This column contains the assigned reference designation. The reference designation appears on the referenced figure.

Description
A brief electrical and/or mechanical description of the component is contained in this column. Abbreviations used are given at the end of this Chapter.

Scientific-Atlanta Part No.
The Scientific-Atlanta part number is listed in this column.

FSCM
The manufacturer's Federal Supply Code for Manufacturers codes is entered here. The code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) effective on the publication date of this manual. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 handbooks. Identifying codes are cross-referenced (code to name) at the end of this Chapter.

Mfr. Part No.
The number assigned to the part by the manufacturer is listed in this column.

6.3 ORDERING PARTS

When ordering parts from Scientific-Atlanta, always include the Scientific-Atlanta part number, the part description, the unit serial number, unit name, subassembly name, part manufacturer, and manufacturer's part number.

MODEL 4671 IF/BB ANALYZER - 155939

REF DESIG PREFIX 01

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A01	154272	CARD CAGE ASSY		
A02	147607	30 KHZ IF MODULE ASSY		
A03	147610	MODULE ASSY IF LO		
A04	147621	MODULE ASSY IF CONVERTER		
A05	147622	BASEBAND CONVERTER MODULE ASSY		
A06	155596	MODULE ASSY 302 KHZ IF WITH OSCILLATOR		
A07	148748	PWB ASSY, LAMP LOGIC		
A08	147661	REAR PNL, IF/BB ANALYZR MDL 4670-1, ASSY		
A09	156460	FRONT PNL ASSY IF/BB ANALYZER MDL 4671-1		
A10		NOT ASSIGNED		
A11	147739	ATTENUATOR LOGIC PWB ASSY		
A12	148751	PWB ASSY, DISPLAY INTERFACE		
A13	156461	MODULE ASSY - BASEBAND LOCAL OSCILLATOR		
T01	148688	POWER XFMR ASSY IF/BB ANALYZR MDL 4670-1		
W01	85129	AC POWER CABLE		
W02	150143	CABLE, RF		
W03	150144	CABLE, RF		
W04	147644	CABLE, RF		
W05	150140	CABLE, RF		
W06	150145	CABLE, RF		
W07	150146	CABLE, RF		
W08	150147	CABLE, RF		
W09	150148	CABLE, RF		
W10	150149	CABLE, RF		
W11	150075	CABLE, RF		
W12	148666	CABLE, RIBBON ASSY - 30KHZ		
W13	148665	CABLE, RIBBON ASSY - LAMP LOGIC PWB		
W14	148664	CABLE, RIBBON ASSY - ATTEN LOGIC PWB		
W17	148661	CABLE, RIBBON ASSY - RF INTERFACE PWB		
W19	148699	CABLE, RIBBON ASSY - DISPLAY PWB		
W22	150141	CABLE, RF		
W23	148674	CABLE RECORDER INTERFACE		
	40775	KNOB		
	40778	KNOB		
	85525	KNOB		

CARD CAGE ASSEMBLY - 154272

REF DESIG PREFIX A01

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A01	147685	A/D ARITHMETIC PWB ASSY		
A02	147691	COUNTER PWB ASSY		
A03	147697	AUTO-RANGE AND LOG AMPLIFIER ASSY		
A04	154265	PWB ASSY-SWEEP GENERATOR AND MODE LOGIC		
A05	154262	PWB ASSY - SCAN CONTROL		
A06	154268	PWB ASSY - METER AND RECORDER INTERFACE		
A07	147555	PWB ASSY CARD EXTENDER		
A08		NOT ASSIGNED		
A09	147550	POWER SUPPLY PWB ASSY		
A10	154271	PWB ASSY - MOTHERBOARD		
C01	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C02	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
P01	82953	CONN MISC BODY W/O INSERTS 10 HOLES	00779	87133-5
	150914	ATTENUATOR ASSY		

A/D ARITHMETIC ASSEMBLY - 147685

REF DESIG PREFIX A01A01

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	76523	DIODE 1N4372A SI ZEN 3.0V 5% .4W	04713	1N4372A
CR02	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
C01	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C02	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C03	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C04	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C05	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C06	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C07	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C08	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C09	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C10	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C11	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C12	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C13	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C14	86013	CAPACITR 22 MF 25V SOLID TANT POL 10%		T362C226K025AS
C15	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C16	81934	CAPACITR 18 PF 100V CER DISC	72982	835-C0G0-180J
C17	81934	CAPACITR 18 PF 100V CER DISC	72982	835-C0G0-180J
C18	81101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C19	81101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C20	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C21	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C22	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
J01	84585	CONN HEADER DBL ROW RT ANGLE 10-PIN PC	00779	87230-5
R01	74696	RESISTOR 470 OHM 1/4W 5% COMP	01121	RCR07G471JS
R02	77592	RESISTOR 120 OHM 1/4W 5% COMP	01121	RCR07G121JS
R03	71982	RESISTOR 2.7K OHM 1/4W 10% COMP	01121	RCR07G272KS
R04	71876	RESISTOR 68 OHM 1/4W 10% COMP	01121	RCR07G680KS
R05	71993	RESISTOR 3.9K OHM 1/4W 10% COMP	01121	RCR07G392KS
R06	77598	POT 10K OHM 3/4W CERMET 15T PC MT	73138	79PR10K
R07	78137	POT 2K OHM 3/4W CERMET 15T PC MT	73138	79PR2K
R08	78892	RESISTOR 1.50K OHM RN60C 1% MTL FLM		RN60C1501F
R09	82121	RESISTOR 7.15K OHM RN60C 1% MTL FLM		RN60C7151F
R10	78239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R11	78239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R12	82138	RESISTOR 24.9K OHM RN60C 1% MTL FLM		RN60C2492F
R13	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R14	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R15	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R16	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R17	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R18	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R19	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R20	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R21	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R22	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R23	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R24	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R25	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R26	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R27	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R28	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R29	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R30	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R31	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R32	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R33	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R34	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
U01	85037	IC MICRO CLOCK GENERATOR		P4201A
U02	85038	IC 4-BIT MICROPROCESSOR 4004 CPU		4004
U03	147588	ROM MASK PROGRAMMED SPEC CONTROL DWG		
U04	85036	IC CMOS 3 1/2 DIGIT A/D LOGIC SUBSYSTEM	04713	MC14435VL
U05	85035	IC DUAL RAMP A/D CONVERTER SUBSYSTEM	04713	MC1405L
U06	84687	IC CMOS 8-IN DATA SELECTOR	04713	MC14512CL

A/D ARITHMETIC ASSEMBLY - 147685

REF DESIG PREFIX A01A01

COMP DESIG	S-A PART NO	DESCRIPTION		FSCM	MFR PART NO
U07	84686	IC CMOS DUAL 4-IN MULTIPLEXER		04713	MC14539CL
U08	84686	IC CMOS DUAL 4-IN MULTIPLEXER		04713	MC14539CL
U09	84890	IC OP AMP GEN PUR +70C 8-PIN DIP	741C	04713	MC1741CP1
U10	83016	IC CMOS QUAD 2-IN NAND GATE		04713	MC14011CL
U11	85034	IC VOLTAGE RGLTR NEG 8 VOLTS		12040	LM320T-8.0
Y01	85498	CRYSTAL 5.185 MHZ SERIES MODE .01%		71450	MPO-51

COUNTER PWB ASSY - 147691

REF DESIG PREFIX A01A02

COMP DESIG	S-A PART NO	----------DESCRIPTION----------	FSCM	-----MFR PART NO-----
C01	70518	CAPACITR 100 PF 1KV CER DISC	71590	DD-101
C02	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C03	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C04	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C05	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C06	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
R01	72002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R02	72002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R03	72002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R04	72077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R05	72077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R06	72077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R07	72077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
U01	83062	IC CMOS TRIPLE 3-IN NOR GATE	04713	MC14025CL
U02	83016	IC CMOS QUAD 2-IN NAND GATE	04713	MC14011CL
U03	83060	IC CMOS DUAL 4-BIT SHIFT REGISTER	04713	MC14015CL
U04	83350	IC CMOS DUAL BCD UP COUNTER	04713	MC14518CL
U05	83350	IC CMOS DUAL BCD UP COUNTER	04713	MC14518CL
U06	83350	IC CMOS DUAL BCD UP COUNTER	04713	MC14518CL
U07	83011	IC CMOS DUAL TYPE D FLIP-FLOP	04713	MC14013CL
U08	84279	IC TTL QUAD 2-IN NAND GATE	01295	SN74LS00N
U09	84032	IC TTL DECADE COUNTER	01295	SN74LS90N
U10	83350	IC CMOS DUAL BCD UP COUNTER	04713	MC14518CL
U11	83008	IC CMOS BCD UP DOWN COUNTER	04713	MC14510CL
U12	84145	IC CMOS QUAD 2-IN OR GATE +85C	04713	MC14071CL
U13	84174	IC CMOS DUAL 4-IN OR GATE	79089	CD4072BF
U14	84174	IC CMOS DUAL 4-IN OR GATE	79089	CD4072BF
U15	83016	IC CMOS QUAD 2-IN NAND GATE	04713	MC14011CL
U16	83351	IC CMOS 8-BIT STATIC SHIFT REGISTER	04713	MC14021CL
U17	83351	IC CMOS 8-BIT STATIC SHIFT REGISTER	04713	MC14021CL
U18	83351	IC CMOS 8-BIT STATIC SHIFT REGISTER	04713	MC14021CL
U19	83351	IC CMOS 8-BIT STATIC SHIFT REGISTER	04713	MC14021CL
U20	83016	IC CMOS QUAD 2-IN NAND GATE	04713	MC14011CL
U21	83016	IC CMOS QUAD 2-IN NAND GATE	04713	MC14011CL
U22	83350	IC CMOS DUAL BCD UP COUNTER	04713	MC14518CL
U23	83016	IC CMOS QUAD 2-IN NAND GATE	04713	MC14011CL
U24	84032	IC TTL DECADE COUNTER	01295	SN74LS90N
U25	84283	IC TTL DUAL D-TYPE FLIP-FLOP	01295	SN74LS74N

AUTO-RANGE & LOG AMPLIFIER ASSY 147697

REF DESIG PREFIX A01A03

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A 001	0084952	CONVERTER TRUE RMS-TO-DC	13919	4341
C 001	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 002	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 003	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 004	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 005	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 006	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 007	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 008	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 009	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 010	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 011	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 012	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 013	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 014	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 015	0084216	CAPACITR .0027 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-272K
C 016	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 017	0077256	CAPACITR 470 PF 100V SILVER MICA 5%	14655	CD7FA471J03
C 018	0075193	CAPACITR .001 MF 500V SILVER MICA 5%	14655	CD19FD102J03
C 019	0077256	CAPACITR 470 PF 100V SILVER MICA 5%	14655	CD7FA471J03
C 020	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 021	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 022	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 023	0081210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C 024	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 025	0081210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C 027	0070517	CAPACITR 100 PF 500V SILVER MICA 5%	14655	CD15FD101J03
C 028	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 029	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 030	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 031	0076469	CAPACITR 10 PF 500V SILVER MICA 5%	53021	D105C100J03
C 032	0076469	CAPACITR 10 PF 500V SILVER MICA 5%	53021	D105C100J03
C 033	0081995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
CR001	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR002	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR003	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR004	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR005	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR006	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR007	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR008	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR009	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR010	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR011	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR012	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR013	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR014	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
L 001	0085053	INDUCTOR 22 MH MIN SHLD ENCAP 10%	72259	SWD22000
L 002	0085053	INDUCTOR 22 MH MIN SHLD ENCAP 10%	72259	SWD22000
R 001	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 002	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 003	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 004	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 005	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 006	0082119	RESISTOR 6.49K OHM RN60C 1% MTL FLM		RN60C6491F
R 007	0077597	POT 5K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-502
R 008	0081218	RESISTOR 20.5K OHM RN60C 1% MTL FLM		RN60C2052F
R 009	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 010	0072019	RESISTOR 8.2K OHM 1/4W 10% COMP	01121	RCR07G822KS
R 011	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 012	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 013	0082119	RESISTOR 6.49K OHM RN60C 1% MTL FLM		RN60C6491F
R 014	0077597	POT 5K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-502
R 015	0081218	RESISTOR 20.5K OHM RN60C 1% MTL FLM		RN60C2052F
R 016	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 017	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 018	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 019	0082119	RESISTOR 6.49K OHM RN60C 1% MTL FLM		RN60C6491F
R 020	0077597	POT 5K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-502
R 021	0081218	RESISTOR 20.5K OHM RN60C 1% MTL FLM		RN60C2052F

AUTO-RANGE & LOG AMPLIFIER ASSY 147697

REF DESIG PREFIX A01A03

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R 022	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 023	0080213	RESISTOR 100K OHM RN60C 1% MTL FLM		RN60C1003F
R 024	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 025	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 029	0072214	RESISTOR 4.7 MEG 1/4W 10% COMP	01121	RCR07G475KS
R 031	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 033	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 034	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 035	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 036	0071887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R 037	0078579	RESISTOR 75.0K OHM RN60C 1% MTL FLM		RN60C7502F
R 038	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 039	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R 040	0078243	RESISTOR 40.2K OHM RN60C 1% MTL FLM		RN60C4022F
R 041	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 042	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 043	0078242	RESISTOR 681 OHM RN60C 1% MTL FLM		RN60C6810F
R 044	0084956	RESISTOR 39.2K OHM RN60C 1% MTL FLM		RN60C3922F
R 045	0083641	POT 20K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-203
R 046	0078248	RESISTOR 1.00K OHM RN60C 1% MTL FLM		RN60C1001F
R 047	0080239	RESISTOR 16.2K OHM RN60C 1% MTL FLM		RN60C1622F
R 048	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 049	0082124	RESISTOR 9.09K OHM RN60C 1% MTL FLM		RN60C9091F
R 050	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 051	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 052	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 053	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 054	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 055	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 056	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 057	0082109	RESISTOR 2.61K OHM RN60C 1% MTL FLM		RN60C2611F
R 058	0082124	RESISTOR 9.09K OHM RN60C 1% MTL FLM		RN60C9091F
R 059	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 060	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 061	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 062	0078577	RESISTOR 20.0K OHM RN60C 1% MTL FLM		RN60C2002F
R 063	0078577	RESISTOR 20.0K OHM RN60C 1% MTL FLM		RN60C2002F
R 064	0080237	RESISTOR 4.02K OHM RN60C 1% MTL FLM		RN60C4021F
R 065	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 066	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 067	0078898	RESISTOR 2.49K OHM RN60C 1% MTL FLM		RN60C2491F
R 068	0078577	RESISTOR 20.0K OHM RN60C 1% MTL FLM		RN60C2002F
R 069	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 070	0072207	RESISTOR 2.2 MEG 1/4W 10% COMP	01121	RCR07G225KS
R 071	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 072	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 073	0078456	RESISTOR 60.4K OHM RN60D 1% MTL FLM		RN60D6042F
R 074	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 075	0072207	RESISTOR 2.2 MEG 1/4W 10% COMP	01121	RCR07G225KS
R 076	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 077	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 078	0078578	RESISTOR 36.5K OHM RN60C 1% MTL FLM		RN60C3652F
R 079	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 080	0072207	RESISTOR 2.2 MEG 1/4W 10% COMP	01121	RCR07G225KS
R 081	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 082	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 083	0082156	RESISTOR 127K OHM RN60C 1% MTL FLM		RN60C1273F
R 084	0082107	RESISTOR 2.26K OHM RN60C 1% MTL FLM		RN60C2261F
R 085	0072207	RESISTOR 2.2 MEG 1/4W 10% COMP	01121	RCR07G225KS
R 086	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 087	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 088	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 089	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 090	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 092	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 093	0078243	RESISTOR 40.2K OHM RN60C 1% MTL FLM		RN60C4022F
R 094	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 095	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
U 001	0084886	IC OP AMP 8L-DIP 70C COMP HI SLEW	12040	LM318N
U 002	0084291	IC CMOS MUX/DEMUX ANALOG 2BIT/3CHNL TO 1	79089	CD4053AF
U 003	0084886	IC OP AMP 8L-DIP 70C COMP HI SLEW	12040	LM318N
U 004	0084291	IC CMOS MUX/DEMUX ANALOG 2BIT/3CHNL TO 1	79089	CD4053AF
U 005	0084886	IC OP AMP 8L-DIP 70C COMP HI SLEW	12040	LM318N

AUTO-RANGE & LOG AMPLIFIER ASSY 147697

REF DESIG PREFIX A01A03

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
U 006	0084291	IC CMOS MUX/DEMUX ANALOG 2BIT/3CHNL TO 1	79089	CD4053AF
U 007	0084886	IC OP AMP 8L-DIP 70C COMP HI SLEW	12040	LM318N
U 008	0084145	IC CMOS GATE OR 2-IN QUAD	04713	MC14071BCL
U 009	0083622	IC CMOS GATE AND 2-IN QUAD	04713	MC14081BCL
U 010	0083017	IC CMOS GATE NOR 2-IN QUAD	04713	MC14001BCL
U 011	0078219	IC TRANSSTR ARRAY 2-NPN TEMP COMPENSATED	13715	726 HC
U 012	0082478	IC OP AMP 8L-TO5 70C COMP GEN PURP	04713	MC1456G
U 013	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 014	0083013	IC CMOS BUFFER HEX	04713	MC14050BCL
U 015	0078977	IC OP AMP 8L-TO5 70C COMP 741C	04713	MC1741CG
U 016	0083240	IC COMPARATOR-VOLTAGE 14L-DIP QUAD	12040	LM339N
U 017	0083017	IC CMOS GATE NOR 2-IN QUAD	04713	MC14001BCL
U 018	0083017	IC CMOS GATE NOR 2-IN QUAD	04713	MC14001BCL
U 019	0084957	IC CMOS REGISTER 8-BIT BIDIRECTION BUS	04713	MC14034CL
U 020	0087879	IC CMOS MULTI MONO RETRIG DUAL PREC		MC14538BCL
U 021	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL

PWB ASSY-SWEEP GENERATOR & MODE LOGIC 154265

REF DESIG PREFIX A01A04

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C 001	0077713	CAPACITR .005 MF 50V CER DISC Z5V-20+80%	71590	CK-502
C 002	0080039	CAPACITR 10 MF 20V SOLID TANT POL 10%		CS13BE106K
C 003	0081995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C 004	0085805	CAPACITR 22 MF 35V SOLID TANT POL 10%	80183	150D226X9035R2
C 005	0070613	CAPACITR 1 MF 200V MET PLYEST OVAL 10%	84411	X663F
C 006	0081995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C 007	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 008	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 009	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 010	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 011	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 012	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 013	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 014	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 015	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 016	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
CR001	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR002	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR003	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR004	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR005	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR006	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR007	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR008	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR009	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR010	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR011	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR012	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR013	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR014	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR015	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR016	0078696	DIODE 1N746A SI ZEN 3.3V 5% .4W	01295	1N746A
CR017	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR018	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR019	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR020	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR021	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR022	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR023	0071110	DIODE 1N277 GER 100V 75MA	80368	1N277
CR024	0071110	DIODE 1N277 GER 100V 75MA	80368	1N277
Q 001	0077147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q 002	0083033	TRANSSTR 2N2907A PNP SIL		2N2907A
Q 003	0079660	TRANSSTR 2N4093 FET N-CHNL JUNC	04713	2N4093
R 001	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 002	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 003	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 004	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 005	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 006	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 007	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 008	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 009	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 010	0071982	RESISTOR 2.7K OHM 1/4W 10% COMP	01121	RCR07G272KS
R 011	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 012	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 013	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 014	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 015	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 016	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 017	0082148	RESISTOR 53.6K OHM RN60C 1% MTL FLM		RN60C5362F
R 018	0072165	RESISTOR 470K OHM 1/4W 10% COMP	01121	RCR07G474KS
R 019	0082152	RESISTOR 82.5K OHM RN60C 1% MTL FLM		RN60C8252F
R 020	0072014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R 021	0082138	RESISTOR 24.9K OHM RN60C 1% MTL FLM		RN60C2492F
R 022	0082155	RESISTOR 121K OHM RN60C 1% MTL FLM		RN60C1213F
R 023	0080213	RESISTOR 100K OHM RN60C 1% MTL FLM		RN60C1003F
R 024	0082184	RESISTOR 649K OHM RN60C 1% MTL FLM		RN60C6493F
R 025	0072014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R 026	0072123	RESISTOR 150K OHM 1/4W 10% COMP	01121	RCR07G154KS
R 027	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 028	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS

PWB ASSY-SWEEP GENERATOR & MODE LOGIC 154265

REF DESIG PREFIX A01A04

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R 029	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 030	0082138	RESISTOR 24.9K OHM RN60C 1% MTL FLM		RN60C2492F
R 031	0082128	RESISTOR 12.1K OHM RN60C 1% MTL FLM		RN60C1212F
R 032	0082138	RESISTOR 24.9K OHM RN60C 1% MTL FLM		RN60C2492F
R 033	0079105	RESISTOR 825K OHM RN60C 1% MTL FLM		RN60C8253F
R 034	0079652	RESISTOR 909K OHM RN60C 1% MTL FLM		RN60C9093F
R 035	0078247	RESISTOR 4.53K OHM RN60D 1% MTL FLM		RN60D4531F
R 036	0082161	RESISTOR 187K OHM RN60C 1% MTL FLM		RN60C1873F
R 037	0072214	RESISTOR 4.7 MEG 1/4W 10% COMP	01121	RCR07G475KS
R 038	0082169	RESISTOR 287K OHM RN60C 1% MTL FLM		RN60C2873F
R 039	0078238	RESISTOR 499 OHM RN60C 1% MTL FLM		RN60C4990F
R 040	0082186	RESISTOR 750K OHM RN60C 1% MTL FLM		RN60C7503F
R 041	0072014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R 042	0076956	POT 1K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-102
R 043	0082123	RESISTOR 8.66K OHM RN60C 1% MTL FLM		RN60C8661F
R 044	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 045	0072207	RESISTOR 2.2 MEG 1/4W 10% COMP	01121	RCR07G225KS
R 046	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 047	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 048	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 049	0078577	RESISTOR 20.0K OHM RN60C 1% MTL FLM		RN60C2002F
R 050	0082076	RESISTOR 110 OHM RN60C 1% MTL FLM		RN60C1100F
R 051	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 052	0072214	RESISTOR 4.7 MEG 1/4W 10% COMP	01121	RCR07G475KS
TP001	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP002	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP003	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP004	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP005	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP006	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
U 001	0083016	IC CMOS GATE NAND 2-IN QUAD	04713	MC14011BCL
U 002	0083062	IC CMOS GATE NOR 3-IN TRIPLE	04713	MC14025BCL
U 003	0084145	IC CMOS GATE OR 2-IN QUAD	04713	MC14071BCL
U 004	0085806	IC CMOS GATE AND 3-IN TRIPLE	04713	MC14073BCL
U 005	0083011	IC CMOS FLIP-FLOP TYPE-D DUAL	04713	MC14013BCL
U 006	0083623	IC CMOS MULTI MONO RETRIG DUAL	04713	MC14528BCL
U 007	0083622	IC CMOS GATE AND 2-IN QUAD	04713	MC14081BCL
U 008	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
U 009	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
U 010	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
U 011	0081901	IC OP AMP JFET 8L-T039 85C COMP	12040	LH0042CH
U 012	0084890	IC OP AMP 8L-DIP 70C COMP 741C	04713	MC1741CP1
U 013	0089531	IC OP AMP JFET 8L-DIP		TL071ACJG
(1) U 013	0081901	IC OP AMP JFET 8L-T039 85C COMP	12040	LH0042CH
U 014	0083240	IC COMPARATOR-VOLTAGE 14L-DIP QUAD	12040	LM339N

(1) APPLIES TO SERIAL NUMBER 430 AND BELOW (APPROXIMATELY).

PWB ASSY-SCAN CONTROL 154262

REF DESIG PREFIX A01A05

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C 001	0075193	CAPACITR .001 MF 500V SILVER MICA 5%	14655	CD19FD102J03
C 002	0075193	CAPACITR .001 MF 500V SILVER MICA 5%	14655	CD19FD102J03
C 003	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 004	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 005	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 006	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 007	0070517	CAPACITR 100 PF 500V SILVER MICA 5%	14655	CD15FD101J03
C 008	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 009	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 010	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 011	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 012	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 013	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 014	0079110	CAPACITR 110 PF 500V SILVER MICA 5%	14655	CD15FD111J03
C 015	0070534	CAPACITR 330 PF 500V SILVER MICA 5%	14655	CD15FD331J03
C 016	0079110	CAPACITR 110 PF 500V SILVER MICA 5%	14655	CD15FD111J03
C 017	0070525	CAPACITR 150 PF 1KV CER DISC S3N 10%	71590	DD-151
C 018	0081829	CAPACITR 15 PF 500V SILVER MICA +-.5 PF	53021	D155C150D03
C 019	0070613	CAPACITR 1 MF 200V MET PLYEST OVAL 10%	84411	X663F
C 020	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 021	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 022	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 023	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 024	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 025	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 026	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
CR001	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR002	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR003	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR004	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR005	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR006	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR007	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR008	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR009	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR010	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR011	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR012	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR013	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR014	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR015	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR016	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR017	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR018	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR019	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR020	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR021	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR022	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR023	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
J 001	0081632	SOCKET PIN .040 DIA CLOSED BOTTOM	71279	450-3704-01-06-00
J 002	0081632	SOCKET PIN .040 DIA CLOSED BOTTOM	71279	450-3704-01-06-00
J 003	0081632	SOCKET PIN .040 DIA CLOSED BOTTOM	71279	450-3704-01-06-00
L 001	0079089	INDUCTOR 1.62-1.98 UH PC MOUNT	71279	7107-16
L 002	0078716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
L 003	0078716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
P 001	0082455	JUMPER WALF INSULATED .20 SPACING	71279	461-2871-01-00-10
Q 001	0077147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
R 001	0071901	RESISTOR 180 OHM 1/4W 10% COMP	01121	RCR07G181KS
R 002	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R 003	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R 004	0071918	RESISTOR 330 OHM 1/4W 10% COMP	01121	RCR07G331KS
R 005	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R 006	0071941	RESISTOR 820 OHM 1/4W 10% COMP	01121	RCR07G821KS
R 007	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 008	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R 009	0078243	RESISTOR 40.2K OHM RN60C 1% MTL FLM		RN60C4022F
R 010	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS

PWB ASSY-SCAN CONTROL 154262

REF DESIG PREFIX A01A05

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R 011	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 012	0082192	RESISTOR 15.0K OHM RN60C 1% MTL FLM		RN60C1502F
R 013	0077597	POT 5K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-502
R 014	0072014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R 015	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 016	0072014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R 017	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 018	0083641	POT 20K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-203
R 019	0082153	RESISTOR 86.6K OHM RN60C 1% MTL FLM		RN60C8662F
R 020	0082171	RESISTOR 316K OHM RN60C 1% MTL FLM		RN60C3163F
R 021	0076958	POT 100K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-104
R 022	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 023	0076933	POT 50K OHM 3/4W CER RECT 3/4 LONG 20T	73138	3009P-1-503
R 024	0080243	RESISTOR 200K OHM RN60C 1% MTL FLM		RN60C2003F
R 025	0082149	RESISTOR 64.9K OHM RN60C 1% MTL FLM		RN60C6492F
R 026	0083641	POT 20K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-203
R 027	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 028	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 029	0076958	POT 100K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-104
R 030	0082183	RESISTOR 619K OHM RN60C 1% MTL FLM		RN60C6193F
R 031	0082146	RESISTOR 48.7K OHM RN60C 1% MTL FLM		RN60C4872F
R 032	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 033	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 034	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 035	0082124	RESISTOR 9.09K OHM RN60C 1% MTL FLM		RN60C9091F
R 036	0078022	POT 1 M OHM 3/4W CER RECT 3/4 LONG 20T	80294	3009-1-105
R 037	0080949	RESISTOR 365K OHM RN60C 1% MTL FLM		RN60C3653F
R 038	0082825	RESISTOR 45.3K OHM RN60C 1% MTL FLM		RN60C4532F
R 039	0077598	POT 10K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-103
R 040	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 041	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 042	0078022	POT 1 M OHM 3/4W CER RECT 3/4 LONG 20T	80294	3009-1-105
R 043	0080949	RESISTOR 365K OHM RN60C 1% MTL FLM		RN60C3653F
R 044	0080844	RESISTOR 95.3K OHM RN60C 1% MTL FLM		RN60C9532F
R 045	0083641	POT 20K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-203
R 046	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 047	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 048	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 049	0078022	POT 1 M OHM 3/4W CER RECT 3/4 LONG 20T	80294	3009-1-105
R 050	0080949	RESISTOR 365K OHM RN60C 1% MTL FLM		RN60C3653F
R 051	0082173	RESISTOR 383K OHM RN60C 1% MTL FLM		RN60C3833F
R 052	0076958	POT 100K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-104
R 053	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 054	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 055	0082131	RESISTOR 14.7K OHM RN60C 1% MTL FLM		RN60C1472F
R 056	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 057	0078239	RESISTOR 49.9K OHM RN60C 1% MTL FLM		RN60C4992F
R 058	0078022	POT 1 M OHM 3/4W CER RECT 3/4 LONG 20T	80294	3009-1-105
R 059	0080949	RESISTOR 365K OHM RN60C 1% MTL FLM		RN60C3653F
R 060	0082093	RESISTOR 536 OHM RN60C 1% MTL FLM		RN60C5360F
R 061	0082187	RESISTOR 787K OHM RN60C 1% MTL FLM		RN60C7873F
R 062	0085807	POT 200K OHM 3/4W CER RECT 3/4 LONG 20T	80294	3009P-1-204
R 063	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 064	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 065	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 066	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F
R 067	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 068	0086768	RESISTOR 1.18 MEG RN55C 1% MTL FLM		RN55C1184F
R 069	0082169	RESISTOR 287K OHM RN60C 1% MTL FLM		RN60C2873F
R 070	0080214	RESISTOR 140K OHM RN60C 1% MTL FLM		RN60C1403F
TP001	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP002	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP003	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP004	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP005	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP006	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
U 001	0084281	IC TTL GATE INVERTER HEX	01295	SN74LS04N
U 002	0084878	IC TTL COUNTER BIN 18-MHZ DIVIDE 2X6	01295	SN74LS92N
U 003	0084283	IC TTL FLIP-FLOP TYPE-D DUAL	01295	SN74LS74AN
U 004	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
(1) U 005	0078977	IC OP AMP 8L-T05 70C COMP 741C	04713	MC1741CG
U 005	0089531	IC OP AMP JFET 8L-DIP 70C COMP		TL071ACJG

(1) APPLIES TO SERIAL NUMBER 395 AND BELOW (APPROXIMATELY).

PWB ASSY-SCAN CONTROL 154262

REF DESIG PREFIX A01A05

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
U 006	0081795	IC MIXER DOUBLE BAL 100MHZ 14L-DIP	01295	TL442CN
U 007	0083784	IC TTL MULTI MONO	01295	SN74L121N
U 008	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
U 009	0081901	IC OP AMP JFET 8L-TO39 85C COMP	12040	LH0042CH
U 010	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 011	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
Y 001	0084953	CRYSTAL 6.000 MHZ .001% SERIES MODE	27073	HC-18/U HOLDER

PWB ASSY-METER & RECORDER INTERFACE 15426R

REF DESIG PREFIX A01A06

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C 001	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 002	0070590	CAPACITR .1 MF 100V POLYESTER 10%	14655	WMF1P1E
C 003	0070613	CAPACITR 1 MF 200V MET PLYEST OVAL 10%	84411	X663F
C 004	0070613	CAPACITR 1 MF 200V MET PLYEST OVAL 10%	84411	X663F
C 005	0070613	CAPACITR 1 MF 200V MET PLYEST OVAL 10%	84411	X663F
C 006	0070590	CAPACITR .1 MF 100V POLYESTER 10%	14655	WMF1P1E
C 007	0070613	CAPACITR 1 MF 200V MET PLYEST OVAL 10%	84411	X663F
C 008	0070590	CAPACITR .1 MF 100V POLYESTER 10%	14655	WMF1P1E
C 009	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 010	0070590	CAPACITR .1 MF 100V POLYESTER 10%	14655	WMF1P1E
C 011	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C 012	0070590	CAPACITR .1 MF 100V POLYESTER 10%	14655	WMF1P1E
C 013	0080039	CAPACITR 10 MF 20V SOLID TANT POL 10%		CS13BE106K
C 014		NOT ASSIGNED		
C 015	0080039	CAPACITR 10 MF 20V SOLID TANT POL 10%		CS13BE106K
C 016	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 017	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 018	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 019	0070531	CAPACITR 270 PF 500V SILVER MICA 5%	14655	CD15FD271J03
C 020	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 021	0075216	CAPACITR 5 MF 50V	80183	500D505G050BB7
C 022	0081101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C 023	0085805	CAPACITR 22 MF 35V SOLID TANT POL 10%	80183	150D226X9035R2
CR001	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR002	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR003	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR004	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR005	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR006	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR007	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR008	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR009	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR010	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR011	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR012	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR013	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR014	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR015	0079658	DIODE 1N938 TC REF 9.0V .001% .5W	04713	1N938
CR016	0083984	DIODE 1N5228B SI ZEN 3.9V 5% .5W	13715	1N5228B
CR017	0071142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR018	0076524	DIODE 1N752A SI ZEN 5.6V 5% .4W	04713	1N752A
Q 001	0084916	TRANSSTR 2N4393 FET N-CHNL JUNC	04713	2N4393
Q 002	0077147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q 003	0077148	TRANSSTR 2N3251 PNP SIL	04713	2N3251
R 001	0072165	RESISTOR 470K OHM 1/4W 10% COMP	01121	RCR07G474KS
R 002	0072165	RESISTOR 470K OHM 1/4W 10% COMP	01121	RCR07G474KS
R 003	0072165	RESISTOR 470K OHM 1/4W 10% COMP	01121	RCR07G474KS
R 004	0072165	RESISTOR 470K OHM 1/4W 10% COMP	01121	RCR07G474KS
R 005	0081341	RESISTOR 22 MEG 1/4W 10% COMP	01121	RCR07G226KS
R 006	0078248	RESISTOR 1.00K OHM RN60C 1% MTL FLM		RN60C1001F
R 007	0081218	RESISTOR 20.5K OHM RN60C 1% MTL FLM		RN60C2052F
R 008	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 009	0078571	RESISTOR 2.21K OHM RN60D 1% MTL FLM		RN60D2211F
R 010	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 011	0082126	RESISTOR 10.5K OHM RN60C 1% MTL FLM		RN60C1052F
R 012	0081218	RESISTOR 20.5K OHM RN60C 1% MTL FLM		RN60C2052F
R 013	0082156	RESISTOR 127K OHM RN60C 1% MTL FLM		RN60C1273F
R 014	0076933	POT 50K OHM 3/4W CER RECT 3/4 LONG 20T	73138	3009P-1-503
R 015	0077597	POT 5K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-502
R 016	0078906	RESISTOR 4.99K OHM RN60C 1% MTL FLM		RN60C4991F
R 017	0080242	RESISTOR 90.9K OHM RN60C 1% MTL FLM		RN60C9092F
R 018	0083641	POT 20K OHM 3/4W CER RECT 3/4W LONG 15T	73138	3009P-1-203
R 019	0081341	RESISTOR 22 MEG 1/4W 10% COMP	01121	RCR07G226KS
R 020	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 021	0078248	RESISTOR 1.00K OHM RN60C 1% MTL FLM		RN60C1001F
R 022	0082131	RESISTOR 14.7K OHM RN60C 1% MTL FLM		RN60C1472F
R 025	0072034	RESISTOR 12K OHM 1/4W 10% COMP	01121	RCR07G123KS
R 026	0072123	RESISTOR 150K OHM 1/4W 10% COMP	01121	RCR07G154KS
R 027	0082111	RESISTOR 2.87K OHM RN60C 1% MTL FLM		RN60C2871F
R 028	0078246	RESISTOR 10.0K OHM RN60C 1% MTL FLM		RN60C1002F

PWB ASSY-METER & RECORDER INTERFACE 154268

REF DESIG PREFIX A01A06

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R 029	0072014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R 030	0082191	RESISTOR 49.9 OHM RN60C 1% MTL FLM		RN60C49R9F
R 031	0071913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R 032	0080913	POT 100 OHM 3/4W CER RECT 3/4 LONG 20T	80294	3009P-1-101
R 033	0071887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R 034	0083885	RESISTOR 1.10K OHM RN55C 1% MTL FLM		RN55C1101F
R 035	0080382	RESISTOR 11.0K OHM RN55C 1% MTL FLM		RN55C1102F
R 036	0083098	RESISTOR 649 OHM RN55C 1% MTL FLM		RN55C6490F
R 037	0078933	RESISTOR 10.0K OHM RN55C 1% MTL FLM		RN55C1002F
R 038	0078931	RESISTOR 4.99K OHM RN55C 1% MTL FLM		RN55C4991F
R 039	0083915	RESISTOR 9.53K OHM RN55C 1% MTL FLM		RN55C9531F
R 040	0078137	POT 2K OHM 3/4W CER RECT 3/4 LONG 15T	73138	3009P-1-202
R 041	0071973	RESISTOR 1.8K OHM 1/4W 10% COMP	01121	RCR07G182KS
R 042	0071938	RESISTOR 680 OHM 1/4W 10% COMP	01121	RCR07G681KS
R 043	0071913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R 044	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 045	0072034	RESISTOR 12K OHM 1/4W 10% COMP	01121	RCR07G123KS
R 046	0072034	RESISTOR 12K OHM 1/4W 10% COMP	01121	RCR07G123KS
R 047	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 048	0071960	RESISTOR 1.2K OHM 1/4W 10% COMP	01121	RCR07G122KS
R 049	0072026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R 050	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 051	0072054	RESISTOR 22K OHM 1/4W 10% COMP	01121	RCR07G223KS
R 052	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 053	0072165	RESISTOR 470K OHM 1/4W 10% COMP	01121	RCR07G474KS
R 054	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 055	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 056	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
TP001	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP002	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
TP003	0082909	TERMINAL PRESS MT DISCONNECT .058 PIN	00779	60599-1
U 001	0083017	IC CMOS GATE NOR 2-IN QUAD	04713	MC14001BCL
U 002	0084683	IC CMOS ANALOG SW SPST QUAD 14L-DIP	04713	MC14066BCL
U 003	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 004	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 005	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 006	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 007	0081840	IC OP AMP 8L-DIP 70C COMP DUAL 741C	79089	LM1458N
U 008	0087879	IC CMOS MULTI MONO RETRIG DUAL PREC		MC14538BCL
U 009	0083019	IC CMOS GATE NAND 3-IN TRIPLE	04713	MC14023BCL

POWER SUPPLY PW8 ASSY 147550

REF DESIG PREFIX A01A09

COMP DESIG	S-A PART NO	DESCRIPTION		FSCM	MFR PART NO
C 001	0077245	CAPACITR 3000 MF 30V		80183	39D308G030JS4
C 002	0081101	CAPACITR 1 MF 50V CER MONO 20%		72982	8131-050-651-105M
C 003	0077901	CAPACITR .0015 MF 500V SILVER MICA 5%		14655	CD19FD152J03
C 004	0077901	CAPACITR .0015 MF 500V SILVER MICA 5%		14655	CD19FD152J03
C 005	0077245	CAPACITR 3000 MF 30V		80183	39D308G030JS4
C 006	0081101	CAPACITR 1 MF 50V CER MONO 20%		72982	8131-050-651-105M
C 007	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%		05397	T362B106K025AS
C 008	0035654	CAPACITR 10 MF 25V SOLID TANT POL 10%		05397	T362B106K025AS
C 009	0084977	CAPACITR 3200 MF 25V		80183	39D328G025JP4
C 010	0081101	CAPACITR 1 MF 50V CER MONO 20%		72982	8131-050-651-105M
C 011	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%		72982	8131-050-651-104Z
CR001	0080895	RECTIFIER ASSY 100V 6A SOLDER LUGS		83003	VH148
CR002	0080895	RECTIFIER ASSY 100V 6A SOLDER LUGS		83003	VH148
CR003	0078274	DIODE 1N4002 SIL 100V 1A		04713	1N4002
F 001	0071221	FUSE 1 1/2 AMP		75915	3AG 31201.5
F 002	0071219	FUSE 1 AMP		75915	3AG 312001.
HY001	0085091	CROWBAR 17 VDC 5% 3A			LVC-1212
HY002	0085091	CROWBAR 17 VDC 5% 3A			LVC-1212
HY3	0085139	CROWBAR 5.6 VDC 5% 3A			LVC-1218
L 001	0080599	INDUCTOR 4.7 UH SUBMIN UNSHLD 10%		91637	IR-2
L 002	0080599	INDUCTOR 4.7 UH SUBMIN UNSHLD 10%		91637	IR-2
Q 001	0076316	TRANSSTR 2N4036 PNP SIL		79089	2N4036S
Q 002	0083035	TRANSSTR 2N4239 NPN SIL			2N4239
R 001	0081893	RESISTOR .50 OHM 5W WW 5%		24681	FRL5
R 002	0071862	RESISTOR 47 OHM 1/4W 10% COMP		01121	RCR07G470KS
R 003	0071813	RESISTOR .50 OHM 3W WW 5%		24681	VAL3
R 004	0071822	RESISTOR 3 OHM 3W WW 5%		24681	VAL3
R 005	0077298	RESISTOR 1 OHM 3W WW 5%		24681	VAL-3
R 006	0083570	RESISTOR 1.5 OHM 3W WW 5%		24681	VAL-3
R 007	0071862	RESISTOR 47 OHM 1/4W 10% COMP		01121	RCR07G470KS
R 008	0081893	RESISTOR .50 OHM 5W WW 5%		24681	FRL5
R 009	0081893	RESISTOR .50 OHM 5W WW 5%		24681	FRL5
R 010	0078933	RESISTOR 10.0K OHM RN55C 1% MTL FLM			RN55C1002F
R 011	0076979	POT 20K OHM 1W WW RECT 3/4 LONG 20T		80294	3005P-1-203
R 012	0078932	RESISTOR 6.65K OHM RN55C 1% MTL FLM			RN55C6651F
R 013	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP		01121	RCR07G222KS
R 014	0071836	RESISTOR 10 OHM 1/4W 10% COMP		01121	RCR07G100KS
R 015	0071977	RESISTOR 2.2K OHM 1/4W 10% COMP		01121	RCR07G222KS
R 016	0071836	RESISTOR 10 OHM 1/4W 10% COMP		01121	RCR07G100KS
R 017	0078934	RESISTOR 15.0K OHM RN55C 1% MTL FLM			RN55C1502F
R 018	0078934	RESISTOR 15.0K OHM RN55C 1% MTL FLM			RN55C1502F
U 001	0085164	IC VLTG RGLTR +&- 15V 0.05A TYP	14DIP	04713	MC1468L
U 002	0083235	IC VLTG RGLTR POS 5V 0.5A TYP	TO220	04713	MC7805CT

PWB ASSY-MOTHERBOARD - 154271

REF DESIG PREFIX A01A10

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	78274	DIODE 1N4002 SIL 100V 1A	04713	1N4002
J01	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J02	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J03	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J04	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J05	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J06	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J07	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J08	78279	CONNECTR 22 PIN DOUBLE READOUT	71785	252-22-30-160
J09	84930	CONN HEADER DBL ROW STRAIGHT 20-PIN PC	00779	1-87227-0
J10	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J11	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J12	84930	CONN HEADER DBL ROW STRAIGHT 20-PIN PC	00779	1-87227-0
J13	84930	CONN HEADER DBL ROW STRAIGHT 20-PIN PC	00779	1-87227-0
J14	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J15	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J16	85127	CONN HEADER DBL ROW STRAIGHT 26-PIN PC	00779	1-87227-3
J17	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J18	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J19	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J20	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000

30 KHZ IF MODULE ASSY - 147607

REF DESIG PREFIX A02

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	71122	DIODE 1N914 SIL 75V 75MA	80368	1N914
CR02	71122	DIODE 1N914 SIL 75V 75MA	80368	1N914
C01	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C02	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C03	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C04	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C05	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C06	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C07	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C08	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C09	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C10	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C11	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C12	78804	CAPACITR 170 PF 500V SILVER MICA 1%	53021	D155C171F03
C13	82974	CAPACITR .01 MF 500V SILVER MICA 1%	53021	D305F103F0
C14	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C15	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C16	78804	CAPACITR 170 PF 500V SILVER MICA 1%	53021	D155C171F03
C17	82974	CAPACITR .01 MF 500V SILVER MICA 1%	53021	D305F103F0
C18	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C19	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C20	78806	CAPACITR 200 PF 500V SILVER MICA 1%	53021	D155C201F03
C21	70487	CAPACITR 27 PF 500V SILVER MICA 5%	14655	CD15ED270J03
C22	78818	CAPACITR 390 PF 500V SILVER MICA 1%	53021	D155C391F03
C23	70487	CAPACITR 27 PF 500V SILVER MICA 5%	14655	CD15ED270J03
C24	78806	CAPACITR 200 PF 500V SILVER MICA 1%	53021	D155C201F03
C25	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C26	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C27	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C28	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C29	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C30	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C31	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C32	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C33	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C34	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C35	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C36	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C37	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C38	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C39	70544	CAPACITR .001 MF 1KV CER DISC	71590	DD102
C40	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C41	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C42	80144	CAPACITR 430 PF 500V SILVER MICA 1%	53021	D155C431F03
J01	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J02	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J03	85138	CONN HEADER DBL ROW RT ANGLE 26-PIN PC	00779	1-87230-3
L01	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L02	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L03	84995	INDUCTOR 27 MH MIN SHLD ENCAP 10%	72259	SWD-27000
L04	84995	INDUCTOR 27 MH MIN SHLD ENCAP 10%	72259	SWD-27000
L05	78716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
L06	78716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
R01	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R02	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R03	83918	RESISTOR 12.7K OHM RN55C 1% MTL FLM		RN55C1272F
R04	84883	POT 1K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR1K
R05	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R06	83913	RESISTOR 7.87K OHM RN55C 1% MTL FLM		RN55C7871F
R07	84883	POT 1K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR1K
R08	83923	RESISTOR 20.5K OHM RN55C 1% MTL FLM		RN55C2052F
R09	85626	RESISTOR 20.0K OHM RN55C .5% MTL FLM		RN55C2002D
R10	85626	RESISTOR 20.0K OHM RN55C .5% MTL FLM		RN55C2002D

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REF DESIG PREFIX A02

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R11	83921	RESISTOR 17.8K OHM RN55C 1% MTL FLM		RN55C1782F
R12	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R13	80198	RESISTOR 16.2K OHM RN55C 1% MTL FLM		RN55C1622F
R14	83923	RESISTOR 20.5K OHM RN55C 1% MTL FLM		RN55C2052F
R15	85625	RESISTOR 15.0K OHM RN55C .5% MTL FLM		RN55C1502D
R16	85627	RESISTOR 21.0K OHM RN55C .5% MTL FLM		RN55C2102D
R17	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R18	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R19	83911	RESISTOR 5.62K OHM RN55C 1% MTL FLM		RN55C5621F
R20	84883	POT 1K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR1K
R21	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R22	83909	RESISTOR 4.87K OHM RN55C 1% MTL FLM		RN55C4871F
R23	84883	POT 1K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR1K
R24	78926	RESISTOR 49.9K OHM RN55C 1% MTL FLM		RN55C4992F
R25	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R26	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R27	83909	RESISTOR 4.87K OHM RN55C 1% MTL FLM		RN55C4871F
R28	84883	POT 1K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR1K
R29	78926	RESISTOR 49.9K OHM RN55C 1% MTL FLM		RN55C4992F
R30	80197	RESISTOR 14.7K OHM RN55C 1% MTL FLM		RN55C1472F
R31	80197	RESISTOR 14.7K OHM RN55C 1% MTL FLM		RN55C1472F
R32	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R33	84884	POT 5K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR5K
R34	78933	RESISTOR 10.0K OHM RN55C 1% MTL FLM		RN55C1002F
R35	78933	RESISTOR 10.0K OHM RN55C 1% MTL FLM		RN55C1002F
R36	83918	RESISTOR 12.7K OHM RN55C 1% MTL FLM		RN55C1272F
R37	84884	POT 5K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR5K
R38	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R39	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R40	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R41	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R42	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R43	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R44	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R45	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R46	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R47	71889	RESISTOR 100 OHM 1/2W 10% COMP	01121	RCR20G101KS
R48	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R49	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R50	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R51	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R52	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R53	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R54	72064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R55	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R56	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
U01	84291	IC CMOS TRIPLE 2-IN ANALOG MUX/DEMUX	79089	CD4053AF
U02	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U03	84291	IC CMOS TRIPLE 2-IN ANALOG MUX/DEMUX	79089	CD4053AF
U04	84291	IC CMOS TRIPLE 2-IN ANALOG MUX/DEMUX	79089	CD4053AF
U05	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U06	84291	IC CMOS TRIPLE 2-IN ANALOG MUX/DEMUX	79089	CD4053AF
U07	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U08	84683	IC CMOS QUAD ANALOG SWITCH	04713	MC14066CL
U09	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U10	83017	IC CMOS QUAD 2-IN NOR GATE	04713	MC14001CL
U11	83016	IC CMOS QUAD 2-IN NAND GATE	04713	MC14011CL
U12	84291	IC CMOS TRIPLE 2-IN ANALOG MUX/DEMUX	79089	CD4053AF
U13	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U14	83622	IC CMOS QUAD 2-IN AND GATE	04713	MC14081CL
U15	83014	IC CMOS HEX INVERTER/BUFFER	04713	MC14049CL
U16	84145	IC CMOS QUAD 2-IN OR GATE +85C	04713	MC14071CL

MODULE ASSY IF LO - 147610

REF DESIG PREFIX A03

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR02	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR03	85119	DIODE 5082-2811 UHF SCHOTTKY	28480	5082-2811
C01	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C02	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJ0229C
C03	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C04	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C05	82007	CAPACITR 4.3 PF 100V CER DISC	72982	835-024-COH0-439C
C06	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C07	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C08	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C09	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C10	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C11	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C12	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C13	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C14	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C15	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C16	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C17	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C18	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C19	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C20	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C21	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C22	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C23	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C24	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C25	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C26	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C27	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C28	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C29	79385	CAPACITR 430 PF 500V SILVER MICA 5%	14655	CD15FD431J03
C30	79385	CAPACITR 430 PF 500V SILVER MICA 5%	14655	CD15FD431J03
C31	77318	CAPACITR .22 MF 200V MET MYLAR CVAL 10%	84411	X663F
C32	77318	CAPACITR .22 MF 200V MET MYLAR CVAL 10%	84411	X663F
C33	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C34	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C35	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C36	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C37	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C38	79385	CAPACITR 430 PF 500V SILVER MICA 5%	14655	CD15FD431J03
C39	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C40	78700	FACTORY SELECTED VALUE		
C41	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C42	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C43	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C44	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C45	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C46	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C47	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C48	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C49	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C50	83258	CAPACITR CHIP .1 MF 50V		C1813C104M5XAH
C51	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C52	82002	CAPACITR 2.4 PF 100V CER DISC	72982	835-024-COJ0-249C
C53	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C54	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJ0229C
C55	78700	FACTORY SELECTED VALUE		
C56	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C57	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C58	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C59	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C60	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJ0229C
C61	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C62	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
E01	85677	CORE BEAD FERRITE 7D .375X.187X.500L	78488	57-1839
E02	85677	CORE BEAD FERRITE 7D .375X.187X.500L	78488	57-1839
E03	85677	CORE BEAD FERRITE 7D .375X.187X.500L	78488	57-1839
J01	85041	CONN COAX CONHX SNAP-ON BHD MALE .15 CBL	98291	51-127-0000

MODULE ASSY IF LO - 147610

REF DESIG PREFIX A03

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
J02	85041	CONN COAX CONHX SNAP-ON BHD MALE .15 CBL	98291	51-127-0000
J03	85041	CONN COAX CONHX SNAP-ON BHD MALE .15 CBL	98291	51-127-0000
J04	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J05	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J06	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J07	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
L01	78134	INDUCTOR 1.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L02	78134	INDUCTOR 1.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L03	78134	INDUCTOR 1.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L04	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L05	78134	INDUCTOR 1.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L06	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L07	78134	INDUCTOR 1.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L08	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L09	78134	INDUCTOR 1.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L10	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L11	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L12	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L13	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L14	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L15	145341	INDUCTOR 1.5 T #24 6-32X3/8 INCH CARB J	02113	PER CONT. DWG.
L16	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L17	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L18	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L19	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L20	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L21	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L22	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L23	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L24	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
P03	84938	CONN COAX CONHX SNAP-ON FEM ANGL .15 CBL	98291	51-128-9511
P04	84938	CONN COAX CONHX SNAP-ON FEM ANGL .15 CBL	98291	51-128-9511
Q01	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q02	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q03	84917	TRANSSTR U311 FET N-CHNL JUNC	32293	U311
Q04	77412	TRANSSTR 2N4416 FET N-CHNL JUNC	61637	2N4416
Q05	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q06	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q07	81786	TRANSSTR SRF-378 SIL NPN	04713	SRF-378
Q08	81786	TRANSSTR SRF-378 SIL NPN	04713	SRF-378
R01	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R02	71931	RESISTOR 560 OHM 1/4W 10% COMP	01121	RCR07G561KS
R03	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R04	71894	RESISTOR 120 OHM 1/4W 10% COMP	01121	RCR07G121KS
R05	71920	RESISTOR 390 OHM 1/4W 10% COMP	01121	RCR07G391KS
R06	71897	RESISTOR 150 OHM 1/4W 10% COMP	01121	RCR07G151KS
R07	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R08	71857	RESISTOR 33 OHM 1/4W 10% COMP	01121	RCR07G330KS
R09	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R10	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R11	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R12	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R13	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R14	76707	RESISTOR 2.7 OHM 1/4W 10% COMP	01121	RCR07G2R7KS
R15		NOT ASSIGNED		
R16		NOT ASSIGNED		
R17	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R18	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R19	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R20	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R21	83916	RESISTOR 10.5K OHM RN55C 1% MTL FLM		RN55C1052F
R22	83916	RESISTOR 10.5K OHM RN55C 1% MTL FLM		RN55C1052F
R23	83916	RESISTOR 10.5K OHM RN55C 1% MTL FLM		RN55C1052F
R24	83916	RESISTOR 10.5K OHM RN55C 1% MTL FLM		RN55C1052F
R25	83426	RESISTOR 2.87K OHM RN55C 1% MTL FLM		RN55C2871F
R26	83426	RESISTOR 2.87K OHM RN55C 1% MTL FLM		RN55C2871F

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REF DESIG PREFIX A03

COMP DESIG	S-A PART NO	----------DESCRIPTION----------		FSCM	-----MFR PART NO-----
R27	71857	RESISTOR 33 OHM 1/4W 10% COMP		01121	RCR07G330KS
R28	71857	RESISTOR 33 OHM 1/4W 10% COMP		01121	RCR07G330KS
R29	74727	RESISTOR 10K OHM 1/4W 5% COMP		01121	RCR07G103JS
R30	74702	RESISTOR 1.0K OHM 1/4W 5% COMP		01121	RCR07G102JS
R31	75668	RESISTOR 8.2K OHM 1/4W 5% COMP		01121	RCR07G822JS
R32	72064	RESISTOR 33K OHM 1/4W 10% COMP		01121	RCR07G333KS
R33	71887	RESISTOR 100 OHM 1/4W 10% COMP		01121	RCR07G101KS
R34	71941	RESISTOR 820 OHM 1/4W 10% COMP		01121	RCR07G821KS
R35	71938	RESISTOR 680 OHM 1/4W 10% COMP		01121	RCR07G621KS
R36	74714	RESISTOR 3.3K OHM 1/4W 5% COMP		01121	RCR07G332JS
R37	71913	RESISTOR 270 OHM 1/4W 10% COMP		01121	RCR07G271KS
R38	71887	RESISTOR 100 OHM 1/4W 10% COMP		01121	RCR07G101KS
R39	71907	RESISTOR 220 OHM 1/4W 10% COMP		01121	RCR07G221KS
R40	74693	RESISTOR 390 OHM 1/4W 5% COMP		01121	RCR07G391JS
R41	74687	RESISTOR 220 OHM 1/4W 5% COMP		01121	RCR07G221JS
R42	71931	RESISTOR 560 OHM 1/4W 10% COMP		01121	RCR07G561KS
R43	71913	RESISTOR 270 OHM 1/4W 10% COMP		01121	RCR07G271KS
R44	71894	RESISTOR 120 OHM 1/4W 10% COMP		01121	RCR07G121KS
R45	74693	RESISTOR 390 OHM 1/4W 5% COMP		01121	RCR07G391JS
R46	71862	RESISTOR 47 OHM 1/4W 10% COMP		01121	RCR07G470KS
R47	71857	RESISTOR 33 OHM 1/4W 10% COMP		01121	RCR07G330KS
R48	71913	RESISTOR 270 OHM 1/4W 10% COMP		01121	RCR07G271KS
R49	77524	RESISTOR 75 OHM 1/4W 5% COMP		01121	RCR07G750JS
R50	71913	RESISTOR 270 OHM 1/4W 10% COMP		01121	RCR07G271KS
R51	71894	RESISTOR 120 OHM 1/4W 10% COMP		01121	RCR07G121KS
R52	71876	RESISTOR 68 OHM 1/4W 10% COMP		01121	RCR07G680KS
R53	71920	RESISTOR 390 OHM 1/4W 10% COMP		01121	RCR07G391KS
R54	71931	RESISTOR 560 OHM 1/4W 10% COMP		01121	RCR07G561KS
R55	71862	RESISTOR 47 OHM 1/4W 10% COMP		01121	RCR07G470KS
R56	71857	RESISTOR 33 OHM 1/4W 10% COMP		01121	RCR07G330KS
R57	71897	RESISTOR 150 OHM 1/4W 10% COMP		01121	RCR07G151KS
U01	84832	IC ECL 10/11 TWO-MODULUS PRESCALER		04713	MC12013P
U02	84877	IC TTL DUAL 4-IN NAND BUFFER		01295	SN74S40N
U03	81203	IC PHASE FREQUENCY DETECTOR		04713	MC4044P
U04	84878	IC TTL DIVIDE BY 12 COUNTER		01295	SN74LS92N
U05	84832	IC ECL 10/11 TWO-MODULUS PRESCALER		04713	MC12013P
U06	84890	IC OP AMP GEN PUR +70C 8-PIN DIP	741C	04713	MC1741CP1
W01	148756	WIRING HARNESS IF LO INTERFACE			
W02	148757	CABLE RF			
W03	148758	CABLE RF			
W04	148687	CABLE RF			

MODULE ASSY IF CONVERTER - 147621

REF DESIG PREFIX A04

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	81637	DIODE BD3 GER BACK DIODE	24446	SBD-572
CR02	71143	DIODE 1N4735A SI ZEN 6.2V 5% 1W	04713	1N4735A
CR03	71121	DIODE 1N821 TC REF 6.2V .01% .4W	04713	1N821
CR04	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
C01	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C02	81746	CAPACITR 1 PF 500V CER DISC	72982	831-COKO-109C
C03	82434	CAPACITR 25 PF 100V CER DISC	18796	835-024-COGO-250J
C04	82010	CAPACITR 5.6 PF 100V CER DISC	72982	835-024-COHO-569C
C05	82432	CAPACITR 23 PF 100V CER DISC	18796	835-024-COGO-230J
C06	81924	CAPACITR 7 PF 500V CER DISC	72982	831-COHO-709C
C07	82431	CAPACITR 22 PF 100V CER DISC	18796	835-024-COGO-220J
C08	82006	CAPACITR 3.9 PF 100V CER DISC	72982	835-024-COJO-399C
C09	81924	CAPACITR 7 PF 500V CER DISC	72982	831-COHO-709C
C10		NOT ASSIGNED		
C11	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C12	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C13	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C14	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C15	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C16	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C17	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C18	81746	CAPACITR 1 PF 500V CER DISC	72982	831-COKO-109C
C19	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C20		NOT ASSIGNED		
C21	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C22	70536	CAPACITR 390 PF 500V SILVER MICA 5%	14655	CD15FD391J03
C23	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C24	70536	CAPACITR 390 PF 500V SILVER MICA 5%	14655	CD15FD391J03
C25	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C26	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C27	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C28	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C29	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C30	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C31	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C32	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C33	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C34	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C35	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C36	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C37	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C38	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C39	81827	CAPACITR 160 PF 100V SILVER MICA 2%	53021	D151C161G03
C40	81827	CAPACITR 160 PF 100V SILVER MICA 2%	53021	D151C161G03
C41	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C42	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C43	35760	CAPACITR 4 PF 500V CER DISC	72982	831-COHO-409C
C44	82014	CAPACITR 8.2 PF 100V CER DISC	72982	835-024-COHO-829C
C45	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C46	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C47	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C48	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C49	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C50	83258	CAPACITR CHIP .1 MF 50V		C1813C104M5XAH
C51	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C52	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C53	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C54	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C55	83258	CAPACITR CHIP .1 MF 50V		C1813C104M5XAH
C56	81125	CAPACITR .25-1.5 PF TEFLON TRIMMER PC MT	72982	530-000
C57	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C58	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C59	82014	CAPACITR 8.2 PF 100V CER DISC	72982	835-024-COHO-829C
C60	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C61	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C62	82013	CAPACITR 7.5 PF 100V CER DISC	72982	835-024-COHO-759C
C63	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C64	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C65	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C66	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJO229C
C67	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103

MODULE ASSY IF CONVERTER - 147621

REF DESIG PREFIX A04

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C68	82003	CAPACITR 2.7 PF 100V CER DISC	72982	835-024-COJO-279C
C69	70492	CAPACITR 33 PF 500V SILVER MICA 5%	14655	CD15ED330J03
C70	81125	CAPACITR .25-1.5 PF TEFLON TRIMMER PC MT	72982	530-000
C71	77512	CAPACITR 24 PF 500V SILVER MICA 5%	14655	CD15ED240J03
C72	81743	CAPACITR 75 PF 500V SILVER MICA 5%	14655	CD15ED750J03
C73	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C74	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C75	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJO229C
C76	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C77	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C78	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C79	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C80	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C81	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C82	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJO229C
C83	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJO229C
C84	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C85	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C86	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C87	70519	CAPACITR 120 PF 500V SILVER MICA 5%	14655	CD15FD121J03
C88	81926	CAPACITR 10 PF 500V CER DISC	72982	831-COHO-100C
C89	70498	CAPACITR 47 PF 500V SILVER MICA 5%	14655	CD15ED470J03
C90	81926	CAPACITR 10 PF 500V CER DISC	72982	831-COHO-100C
C91	82007	CAPACITR 4.3 PF 100V CER DISC	72982	835-024-COHO-439C
C92	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
C93	75417	CAPACITR .01 MF 150V CER DISC	71590	DDM-103
E01	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E02	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E03	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
J01	85041	CONN COAX CONHX SNAP-ON BHD MALE .15 CBL	98291	51-127-0000
J02	85041	CONN COAX CONHX SNAP-ON BHD MALE .15 CBL	98291	51-127-0000
J03	85041	CONN COAX CONHX SNAP-ON BHD MALE .15 CBL	98291	51-127-0000
J04	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J05		NOT ASSIGNED		
J06	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J07	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J08	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J09	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J10	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
J11	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J12	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J13	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J14	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J15	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J16	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
L01	149283	INDUCTOR 3.5 T #20 1/4-28X3/8 IN. CARB J	02113	PER CONTROL DWG
L02	149283	INDUCTOR 3.5 T #20 1/4-28X3/8 IN. CARB J	02113	PER CONTROL DWG
L03	149283	INDUCTOR 3.5 T #20 1/4-28X3/8 IN. CARB J	02113	PER CONTROL DWG
L04	149283	INDUCTOR 3.5 T #20 1/4-28X3/8 IN. CARB J	02113	PER CONTROL DWG
L05	78975	INDUCTOR 15 UH SUBMIN UNSHLD 10%	91637	IR-2
L06	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L07	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L08	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L09	78975	INDUCTOR 15 UH SUBMIN UNSHLD 10%	91637	IR-2
L10	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L11	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L12	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L13	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L14	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L15	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L16	145349	INDUCTOR 9.5 T #24 6-32X3/8 INCH CARB J	02113	PER CONT. DWG.
L17	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L18	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L19	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L20	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L21	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L22	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L23	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2

MODULE ASSY IF CONVERTER - 147621

REF DESIG PREFIX A04

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
L24	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L25	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L26	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L27	145341	INDUCTOR 1.5 T #24 6-32X3/8 INCH CARB J	02113	PER CONT. DWG.
L28	145342	INDUCTOR 2.5 T #24 6-32X3/8 INCH CARB J	02113	PER CONT. DWG.
L29	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L30	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L31	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L32	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L33	145343	INDUCTOR 3.5 T #24 6-32X3/8 INCH CARB J	02113	PER CONT. DWG.
L34	145348	INDUCTOR 8.5 T #24 6-32X3/8 INCH CARB J	02113	PER CONT. DWG.
L35	82591	INDUCTOR .39 UH SUBMIN UNSHLD 10%	91637	IR-2
L36	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L37	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L38	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L39	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
P01	82953	CONN MISC BODY W/O INSERTS 10 HOLES	00779	87133-5
P02	84938	CONN COAX CONHX SNAP-ON FEM ANGL .15 CBL	98291	51-128-9511
P03	84938	CONN COAX CONHX SNAP-ON FEM ANGL .15 CBL	98291	51-128-9511
P04	84938	CONN COAX CONHX SNAP-ON FEM ANGL .15 CBL	98291	51-128-9511
P05	82455	PLUG INSULATED JUMPER .20 SPACING	71279	461-2871-01-00-10
P06	82455	PLUG INSULATED JUMPER .20 SPACING	71279	461-2871-01-00-10
Q01	84917	TRANSSTR U311 FET N-CHNL JUNC	32293	U311
Q02	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q03	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q04	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q05	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q06	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q07	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q08	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q09	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q10	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q11	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q12	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q13	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
Q14	35669	TRANSSTR 2N5179 SIL NPN	04713	2N5179
R01	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R02	71967	RESISTOR 1.5K OHM 1/2W 10% COMP	01121	RCR20G152KS
R03	71918	RESISTOR 330 OHM 1/4W 10% COMP	01121	RCR07G331KS
R04	71931	RESISTOR 560 OHM 1/4W 10% COMP	01121	RCR07G561KS
R05	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R06	71920	RESISTOR 390 OHM 1/4W 10% COMP	01121	RCR07G391KS
R07	71853	RESISTOR 27 OHM 1/4W 10% COMP	01121	RCR07G270KS
R08	71920	RESISTOR 390 OHM 1/4W 10% COMP	01121	RCR07G391KS
R09	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R10	71966	RESISTOR 1.5K OHM 1/4W 10% COMP	01121	RCR07G152KS
R11	71897	RESISTOR 150 OHM 1/4W 10% COMP	01121	RCR07G151KS
R12	71966	RESISTOR 1.5K OHM 1/4W 10% COMP	01121	RCR07G152KS
R13	71966	RESISTOR 1.5K OHM 1/4W 10% COMP	01121	RCR07G152KS
R14	71982	RESISTOR 2.7K OHM 1/4W 10% COMP	01121	RCR07G272KS
R15		NOT ASSIGNED		
R16	72054	RESISTOR 22K OHM 1/4W 10% COMP	01121	RCR07G223KS
R17	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R18	71989	RESISTOR 3.3K OHM 1/4W 10% COMP	01121	RCR07G332KS
(1) R19	78724	POT 1K OHM 1/2W CERMET PC MT 3/8 DIA	01121	SV1021
R19	82647	POT 1K OHM 1/2W CER .30 DIA VERT ADJ 4T		3339P-1-102
R20	71941	RESISTOR 820 OHM 1/4W 10% COMP	01121	RCR07G821KS
R21	72002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R22	72002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R23	71931	RESISTOR 560 OHM 1/4W 10% COMP	01121	RCR07G561KS
R24	71897	RESISTOR 150 OHM 1/4W 10% COMP	01121	RCR07G151KS
R25	71907	RESISTOR 220 OHM 1/4W 10% COMP	01121	RCR07G221KS
R26	71960	RESISTOR 1.2K OHM 1/4W 10% COMP	01121	RCR07G122KS
R27	71926	RESISTOR 470 OHM 1/4W 10% COMP	01121	RCR07G471KS
R28	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R29	71941	RESISTOR 820 OHM 1/4W 10% COMP	01121	RCR07G821KS
R30	71918	RESISTOR 330 OHM 1/4W 10% COMP	01121	RCR07G331KS

(1) APPLIES TO SERIAL NUMBER 408 AND BELOW (APPROXIMATELY).

MODULE ASSY IF CONVERTER - 147621

REF DESIG PREFIX A04

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R31	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
(1)-R32	71879	RESISTOR 82 OHM 1/4W 10% COMP	01121	RCR07G820KS
R32	71873	RESISTOR 56 OHM 1/4W 10% COMP	01121	RCR07G560KS
(1)-R33	80370	POT 250 OHM 1/2W CERMET PC MT 3/8 DIA	01121	SV2511
R33	78957	POT 500 OHM 1/2W CER 3/8 DIA VERT ADJ	01121	SV5011
R34	71939	RESISTOR 680 OHM 1/2W 10% COMP	01121	RCR20G681KS
R35	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R36	71919	RESISTOR 330 OHM 1/2W 10% COMP	01121	RCR20G331KS
R37	71921	RESISTOR 390 OHM 1/2W 10% COMP	01121	RCR20G391KS
R38	71954	RESISTOR 1.0K OHM 1/2W 10% COMP	01121	RCR20G102KS
R39	71919	RESISTOR 330 OHM 1/2W 10% COMP	01121	RCR20G331KS
R40	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R41	71907	RESISTOR 220 OHM 1/4W 10% COMP	01121	RCR07G221KS
R42	71889	RESISTOR 100 OHM 1/2W 10% COMP	01121	RCR20G101KS
R43	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R44	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R45	71931	RESISTOR 560 OHM 1/4W 10% COMP	01121	RCR07G561KS
R46	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R47	71894	RESISTOR 120 OHM 1/4W 10% COMP	01121	RCR07G121KS
R48	71920	RESISTOR 390 OHM 1/4W 10% COMP	01121	RCR07G391KS
R49	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R50	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R51	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R52	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R53	71894	RESISTOR 120 OHM 1/4W 10% COMP	01121	RCR07G121KS
R54	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R55	71931	RESISTOR 560 OHM 1/4W 10% COMP	01121	RCR07G561KS
R56	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R57	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R58	71920	RESISTOR 390 OHM 1/4W 10% COMP	01121	RCR07G391KS
R59	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R60	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R61	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R62	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R63	71918	RESISTOR 330 OHM 1/4W 10% COMP	01121	RCR07G331KS
R64	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R65	71897	RESISTOR 150 OHM 1/4W 10% COMP	01121	RCR07G151KS
R66	71907	RESISTOR 220 OHM 1/4W 10% COMP	01121	RCR07G221KS
R67	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
R68	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R69	74702	RESISTOR 1.0K OHM 1/4W 5% COMP	01121	RCR07G102JS
R70	74724	RESISTOR 6.8K OHM 1/4W 5% COMP	01121	RCR07G682JS
R71	74700	RESISTOR 820 OHM 1/4W 5% COMP	01121	RCR07G821JS
R72	75663	RESISTOR 4.3K OHM 1/4W 5% COMP	01121	RCR07G432JS
U01	81840	IC OP AMP 8PIN DIP INT.COMP. DUAL 741C	79089	CA1458G
W01	148680	WIRING HARNESS IF CONVERTER INTERFACE		
W02	148681	CABLE RF		
W03	148682	CABLE RF		
W04	148683	CABLE RF		
Y01	146550	CRYSTAL 120.00 MHZ +-20 PPM SERIES MODE	75378	PER CONTROL DWG
Z01	146551	MIXER DOUBLE-BALANCED PC MT		PER CONTROL DWG
Z02	146551	MIXER DOUBLE-BALANCED PC MT		PER CONTROL DWG

(1)-APPLIES TO SERIAL NUMBER 350 AND BELOW (APPROXIMATELY).

BASEBAND CONVERTER MODULE ASSY - 147622

REF DESIG PREFIX A05

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR02	83981	DIODE 1N5223B SI ZEN 2.7V 5% .5W	13715	1N5223B
CR03	84951	MIXER DOUBLE BALANCED 5-500 MHZ PC MT		RAY-1
(1) CR03	256853	DOUBLE BALANCED MIXER 70KHZ TO 200MHZ		SRA-1
CR04	84170	MIXER DOUBLE BALANCED .5-500MHZ PC MT		
CR05	71143	DIODE 1N4735A SI ZEN 6.2V 5% 1W	04713	1N4735A
CR06	74186	DIODE 1N935A TC REF 9.0V .01% .5W	04713	1N935A
CR07	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
C01	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C02	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C03	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C04	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJ0229C
C05	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C06	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C07	78700	FACTORY SELECTED VALUE		
C08	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C09	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C10	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJ0229C
C11	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C12	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C13	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C14	79171	CAPACITR 9-35 PF MIN CER DISC PC MT	72982	538-011 D 9-35
C15	70509	CAPACITR 68 PF 500V SILVER MICA 5%	14655	CD15ED680J03
C16	79385	CAPACITR 430 PF 500V SILVER MICA 5%	14655	CD15FD431J03
C17	79097	CAPACITR 3-15 PF MIN CER DISC PC MT	72982	538-011 D 3-15
C18	81995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C19	82400	CAPACITR 82 PF 500V SILVER MICA 1%	53021	D155C820F03
C20	35760	CAPACITR 4 PF 500V CER DISC	72982	831-COHO-409C
C21	78808	CAPACITR 220 PF 500V SILVER MICA 1%	53021	D155C221F03
C22	81934	CAPACITR 18 PF 100V CER DISC	72982	835-COGO-180J
C23	78807	CAPACITR 210 PF 500V SILVER MICA 1%	53021	D155C211F03
C24	81931	CAPACITR 15 PF 500V CER DISC	72982	831-COGO-150J
C25	77965	CAPACITR 51 PF 500V SILVER MICA 2%	14655	CD6ED510G03
C26	84561	CAPACITR .0027 MF 500V SILVER MICA 5%	14655	CD19FD272J03
C27	70599	CAPACITR .200 MF 100V DIPPED MYLAR 5%	72136	MDE204JB2A
C28	81808	CAPACITR 2.2 MF 50V CER MONO 20%	72982	8141-M050-225M
C29	79097	CAPACITR 3-15 PF MIN CER DISC PC MT	72982	538-011 D 3-15
C30	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C31	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C32	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C33	79097	CAPACITR 3-15 PF MIN CER DISC PC MT	72982	538-011 D 3-15
C34	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C35	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C36	70496	CAPACITR 43 PF 500V SILVER MICA 5%	14655	CD15ED430J03
C37	79171	CAPACITR 9-35 PF MIN CER DISC PC MT	72982	538-011 D 9-35
C38	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C39	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C40	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C41	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C42	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C43	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C44	81995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C45	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C46	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C47	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C48	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C49	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C50	75200	CAPACITR .0024 MF 500V SILVER MICA 5%	53021	D195C242J03
C51	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C52	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C53	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C54	70525	CAPACITR 150 PF 1KV CER DISC	71590	DD-151
C55	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C56	70487	CAPACITR 27 PF 500V SILVER MICA 5%	14655	CD15ED270J03
C57	81995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C58	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C59	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C60	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C61	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C62	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C63	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C64	77662	CAPACITR 120 PF 300V SILVER MICA 2%	14655	CD6FC121G03

(1) APPLIES TO SERIAL NUMBER 329 THRU 353 (APPROXIMATELY).

BASEBAND CONVERTER MODULE ASSY - 147622

REF DESIG PREFIX A05

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C65	78700	FACTORY SELECTED		
E05	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E06	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E07	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
J01	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J02	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J03	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J04	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J05	85152	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-143-0000
J06	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J07	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J08	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J09	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J10	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J11	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J12	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J13	81632	JACK CONNECTOR .040 DIA	71279	450-3704-01-01-01
J14	84940	CONN COAX CONHX SNAP-ON MALE PC MT	98291	51-151-0000
K01	85052	RELAY 12VDC TO-5 PKG WITH DIODE		7320-12
L01	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L02	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L03	78046	INDUCTOR 3.3 UH SUBMIN UNSHLD 10%	91637	IR-2
L04	78046	INDUCTOR 3.3 UH SUBMIN UNSHLD 10%	91637	IR-2
L05	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L06	82592	INDUCTOR .56 UH SUBMIN UNSHLD 10%	91637	IR-2
L07	78038	INDUCTOR 2.2 UH SUBMIN UNSHLD 10%	91637	IR-2
L08	147524	COIL ASSEMBLY		
L09	147525	COIL ASSEMBLY		
L10	147526	COIL ASSEMBLY		
L11	80117	INDUCTOR 15 UH SUBMIN UNSHLD 1%	09021	8673-3
L12	78839	INDUCTOR 1.2 MH MIN SHLD ENCAP 10%	72259	WEE-1200
L13	79848	INDUCTOR 1.8 UH SUBMIN SHLD ENCAP 10%	72259	WEE-WEE-1.8
L14	79848	INDUCTOR 1.8 UH SUBMIN SHLD ENCAP 10%	72259	WEE-WEE-1.8
L15	79558	INDUCTOR .33 UH SUBMIN SHLD ENCAP 10%	72259	WEE-WEE-.33
L16	78716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
L17	78046	INDUCTOR 3.3 UH SUBMIN UNSHLD 10%	91637	IR-2
L18	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L19	85204	INDUCTOR 22 UH MIN UNSHLD MOLDED 10%	72259	RFC-S-22
L20	85204	INDUCTOR 22 UH MIN UNSHLD MOLDED 10%	72259	RFC-S-22
L21	80809	INDUCTOR 4.7 UH MIN SHLD MOLDED 10%	09021	15S-4R7K
L22	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
P01	82455	PLUG INSULATED JUMPER .20 SPACING	71279	461-2871-01-00-10
P02	82455	PLUG INSULATED JUMPER .20 SPACING	71279	461-2871-01-00-10
P03	82455	PLUG INSULATED JUMPER .20 SPACING	71279	461-2871-01-00-10
Q01	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q02	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q03	85042	TRANSSTR MRF 517 NPN SIL	04713	MRF 517
Q04	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q05	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q06	79329	TRANSSTR 2N5109 NPN SIL	79089	2N5109
Q07	79329	TRANSSTR 2N5109 NPN SIL	79089	2N5109
Q08	77412	TRANSSTR 2N4416 FET N-CHNL JUNC	61637	2N4416
Q09	83100	TRANSSTR TIS 128 PNP SIL	01295	TIS 128
Q10	78215	TRANSSTR 2N5089 NPN SIL	04713	2N5089
RT01	85595	THERMSTR 2.0K OHM AT 25 DEG C +-10%	15801	P832D1
R01	72093	RESISTOR 68K OHM 1/4W 10% COMP	01121	RCR07G683KS
R02	71907	RESISTOR 220 OHM 1/4W 10% COMP	01121	RCR07G221KS
R03	71920	RESISTOR 390 OHM 1/4W 10% COMP	01121	RCR07G391KS

BASEBAND CONVERTER MODULE ASSY - 147622

REF DESIG PREFIX A05

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R04	78929	RESISTOR 1.00K OHM RN55C 1% MTL FLM		RN55C1001F
R05	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R06	83873	RESISTOR 422 OHM RN55C 1% MTL FLM		RN55C4220F
R07	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R08	71914	RESISTOR 270 OHM 1/2W 10% COMP	01121	RCR20G271KS
R09	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R10	74722	RESISTOR 4.7K OHM 1/4W 5% COMP	01121	RCR07G472JS
R11	74711	RESISTOR 2.7K OHM 1/4W 5% COMP	01121	RCR07G272JS
R12	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R13	74693	RESISTOR 390 OHM 1/4W 5% COMP	01121	RCR07G391JS
R14	83906	RESISTOR 3.83K OHM RN55C 1% MTL FLM		RN55C3831F
R15	79723	RESISTOR 51.1 OHM RN55C 1% MTL FLM		RN55C51R1F
R16	76707	RESISTOR 2.7 OHM 1/4W 10% COMP	01121	RCR07G2R7KS
R17	76707	RESISTOR 2.7 OHM 1/4W 10% COMP	01121	RCR07G2R7KS
R18	78887	RESISTOR 1.05K OHM RN60C 1% MTL FLM		RN60C1051F
R19	76707	RESISTOR 2.7 OHM 1/4W 10% COMP	01121	RCR07G2R7KS
R20	76396	RESISTOR 1.0 OHM 1/2W 10% COMP	01121	RCR20G1R0KS
R21	74706	RESISTOR 1.5K OHM 1/4W 5% COMP	01121	RCR07G152JS
(1) R22	76284	RESISTOR 3.3 OHM 1/4W 10% COMP	01121	RCR07G3R3KS
R22	78600	NOT ASSIGNED		
R23	78914	RESISTOR 442 OHM R55C 1% MLT FLM		RN55C4420F
(2) R23	76907	RESISTOR 825 OHM RN55C 1% MTL FLM		RN55C8250F
R24	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R25	83882	RESISTOR 909 OHM RN55C 1% MTL FLM		RN55C9090F
R26	71862	RESISTOR 47 OHM 1/4W 10% COMP	01121	RCR07G470KS
R27	80380	RESISTOR 2.74K OHM RN55C 1% MTL FLM		RN55C2741F
R28	83221	RESISTOR 4.42K OHM RN55C 1% MTL FLM		RN55C4421F
R29	78929	RESISTOR 1.00K OHM RN55C 1% MTL FLM		RN55C1001F
R30	76907	RESISTOR 825 OHM RN55C 1% MTL FLM		RN55C8250F
R31	71896	RESISTOR 120 OHM 1W 10% COMP	01121	RCR32G121KS
R32	71836	RESISTOR 10 OHM 1/4W 10% COMP	01121	RCR07G100KS
R33	71896	RESISTOR 120 OHM 1W 10% COMP	01121	RCR32G121KS
R34	76907	RESISTOR 825 OHM RN55C 1% MTL FLM		RN55C8250F
R35	78929	RESISTOR 1.00K OHM RN55C 1% MTL FLM		RN55C1001F
R36	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R37	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R38	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R39	71926	RESISTOR 470 OHM 1/4W 10% COMP	01121	RCR07G471KS
R40	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R41	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R42	83856	RESISTOR 110 OHM RN55C 1% MTL FLM		RN55C1100F
R43	83876	RESISTOR 499 OHM RN55C 1% MTL FLM		RN55C4990F
R44	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R45	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R46	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R47	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R48	78918	RESISTOR 806 OHM RN55C 1% MTL FLM		RN55C8060F
R49	84885	POT 10K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	6WR10K
R50	78928	RESISTOR 100K OHM RN55C 1% MTL FLM		RN55C1003F
R51	78928	RESISTOR 100K OHM RN55C 1% MTL FLM		RN55C1003F
R54	83942	RESISTOR 75.0K OHM RN55C 1% MTL FLM		RN55C7502F
R55	71926	RESISTOR 470 OHM 1/4W 10% COMP	01121	RCR07G471KS
R56	72054	RESISTOR 22K OHM 1/4W 10% COMP	01121	RCR07G223KS
R57	79120	RESISTOR 200 OHM RN55C 1% MTL FLM		RN55C2000F
R59	84883	POT 1K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR1K
R60	83910	RESISTOR 5.11K OHM RN55C 1% MTL FLM		RN55C5111F
R61	71926	RESISTOR 470 OHM 1/4W 10% COMP	01121	RCR07G471KS
R62	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R63	71857	RESISTOR 33 OHM 1/4W 10% COMP	01121	RCR07G330KS
R64	80997	RESISTOR 2.00K OHM RN60C 1% MTL FLM		RN60C2001F
R65	71993	RESISTOR 3.9K OHM 1/4W 10% COMP	01121	RCR07G392KS
R66	77524	RESISTOR 75 OHM 1/4W 5% COMP	01121	RCR07G750JS
(2) R67	78273	RESISTOR 22 OHM 1/8W 5% COMP	01121	RCR05G220JS
(2) R68	78059	RESISTOR 220 OHM 1/8W 5% COMP	01121	RCR05G221JS
(2) R69	78059	RESISTOR 220 OHM 1/8W 5% COMP	01121	RCR05G221JS
T01	84082	XFMR MATCHING .15-400 MHZ 50 IN 50 OUT		T1-1
T02	84083	XFMR MATCHING .2-350 MHZ 50 IN 200CT OUT		T4-1
U01	82478	IC OP AMP LOW NOISE 7 MHZ TO-5 INT.COMP	04713	MC1456G
U02	78219	IC TEMP CONT DIFF PAIR 726C EQ	13715	726 HC
U03	78715	IC DIFF CASCODE RF AMPL	79089	CA3028A
W01	148697	WIRING HARNESS - BB CONVERTER		
Y01	148742	XTAL, 29.69727MHZ SERIES SPEC CONTRL DWG		
Y02	148534	FILTER, XTAL 30MHZ SOURCE CONTROL DWG		

(1) APPLIES TO SERIAL NUMBER 287 AND BELOW, AND 407 AND ABOVE (APPROXIMATELY).

(2) APPLIES TO SERIAL NUMBER 354 AND ABOVE (APPROXIMATELY).

MODULE ASSY 302 KHZ IF WITH OSCILLATOR - 155596

REF DESIG PREFIX A06

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	77869	DIODE 1N751A SI ZEN 5.1V 5% .4W	04713	1N751A
C01	77863	CAPACITR .001 MF 500V FDTHRU THC GMV	33095	54-804-002-102P
C01	78813	CAPACITR 270 PF 500V SILVER MICA 1%	53021	D155C271F03
C02	77863	CAPACITR .001 MF 500V FDTHRU THC GMV	33095	54-804-002-102P
C02	80142	CAPACITR 20 PF 500V SILVER MICA 5%	14655	CD15ED200J
C03	78700	FACTORY SELECTED VALUE		
C04	77863	CAPACITR .001 MF 500V FDTHRU THC GMV	33095	54-804-002-102P
C04	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C05	84388	CAPACITR 91 PF 500V SILVER MICA 1%	14655	CD15FD910F03
C06	84970	CAPACITR 27 PF 500V SILVER MICA 2%	53021	D155E270G0
C07	80923	CAPACITR 130 PF 500V SILVER MICA 1%	53021	D155C131F03
C08	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C09		NOT ASSIGNED		
C10	84388	CAPACITR 91 PF 500V SILVER MICA 1%	14655	CD15FD910F03
C11	85137	CAPACITR 188 PF 500V SILVER MICA 1%	53021	D15 BY DESCRIPTION
C12	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C13		NOT ASSIGNED		
C14	84971	CAPACITR 62 PF 500V SILVER MICA 1%	53021	D155E620F0
C15	78804	CAPACITR 170 PF 500V SILVER MICA 1%	53021	D155C171F03
C16	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C17	84388	CAPACITR 91 PF 500V SILVER MICA 1%	14655	CD15FD910F03
C18	80142	CAPACITR 20 PF 500V SILVER MICA 5%	14655	CD15ED200J
C19	78803	CAPACITR 150 PF 500V SILVER MICA 1%	53021	D155C151F03
C20	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C21		NOT ASSIGNED		
C22	82399	CAPACITR 75 PF 500V SILVER MICA 1%	53021	D155C750F03
C23	81827	CAPACITR 160 PF 100V SILVER MICA 2%	53021	D151C161G03
C24	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C25	82400	CAPACITR 82 PF 500V SILVER MICA 1%	53021	D155C820F03
C26	80142	CAPACITR 20 PF 500V SILVER MICA 5%	14655	CD15ED200J
C27	73494	CAPACITR 22 PF 500V SILVER MICA 5%	14655	CD15ED220J03
C28	84972	CAPACITR .0013 MF 500V SILVER MICA 1%	53021	D195E132F0
C29	78808	CAPACITR 220 PF 500V SILVER MICA 1%	53021	D155C221F03
C30	77369	CAPACITR 47 PF 500V SILVER MICA 2%	14655	CD6ED470G03
C31	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C32	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C33	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C34	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C35	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C36	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C37	82394	CAPACITR 510 PF 100V SILVER MICA 5%	53021	D151F511J0
C38	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C39	70517	CAPACITR 100 PF 500V SILVER MICA 5%	14655	CD15FD101J03
C40	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T3628106K025AS
C41	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T3628106K025AS
C42	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C43	84973	CAPACITR .0016 MF 500V SILVER MICA 1%	53021	D195E162F0
C44	81833	CAPACITR 73 PF 500V SILVER MICA 2%	53021	D155C730G03
C45	82972	CAPACITR .0082 MF 500V SILVER MICA 1%	53021	D305F822F0
C46	85135	CAPACITR 592 PF 300V SILVER MICA 1%	53021	D15 BY DESCRIPTION
C47	80146	CAPACITR 675 PF 500V SILVER MICA 1%	53021	D155CXXXF03 675 PF
C48	77955	CAPACITR 3 PF 500V SILVER MICA +-1PF	14655	CD6CD030C03
C49	80769	CAPACITR .0091 MF 100V SILVER MICA 1%	53021	D201C912F03
C50	77256	CAPACITR 470 PF 100V SILVER MICA 5%	14655	CD7FA471J03
C51		NOT ASSIGNED		
C52	82401	CAPACITR 400 PF 500V SILVER MICA 1%	53021	D155C401F03
C53	80769	CAPACITR .0091 MF 100V SILVER MICA 1%	53021	D201C912F03
C54	77958	CAPACITR 680 PF 100V SILVER MICA 2%	14655	CD7FA681G03
C55	78819	CAPACITR 470 PF 500V SILVER MICA 1%	53021	D155C471F03
C56	77955	CAPACITR 3 PF 500V SILVER MICA +-1PF	14655	CD6CD030C03
C57	80769	CAPACITR .0091 MF 100V SILVER MICA 1%	53021	D201C912F03
C58	85136	CAPACITR 650 PF 300V SILVER MICA 1%	53021	D15 BY DESCRIPTION
C59	80144	CAPACITR 430 PF 500V SILVER MICA 1%	53021	D155C431F03
C60	77960	CAPACITR 15 PF 500V SILVER MICA 5%	14655	CD10CD150J03
C61	80769	CAPACITR .0091 MF 100V SILVER MICA 1%	53021	D201C912F03
C62	77256	CAPACITR 470 PF 100V SILVER MICA 5%	14655	CD7FA471J03
C63	82401	CAPACITR 400 PF 500V SILVER MICA 1%	53021	D155C401F03
C64	78810	CAPACITR 240 PF 500V SILVER MICA 1%	53021	D155C241F03
C65	82972	CAPACITR .0082 MF 500V SILVER MICA 1%	53021	D305F822F0
C66	78711	CAPACITR 560 PF 300V SILVER MICA 10%	53021	D153C561K03
C67	84974	CAPACITR .0018 MF 500V SILVER MICA 1%	53021	D195E182F0

MODULE ASSY 302 KHZ IF WITH OSCILLATOR - 155596

REF DESIG PREFIX A06

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C68	81827	CAPACITR 160 PF 100V SILVER MICA 2%	53021	D151C161G03
C69	76469	CAPACITR 10 PF 500V SILVER MICA 5%	53021	D105C100J03
C70	35654	CAPACITR 10 MF 25V SOLID TANT PCL 10%	05397	T362B106K025AS
C71	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C72	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C77	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C78	76471	CAPACITR 33 PF 500V SILVER MICA 5%	53021	D105C330J03
J01	85152	CONN COAX CONHX SNAP-ON MALE TO SLDR CUP	98291	51-143-0000
J02	85152	CONN COAX CONHX SNAP-ON MALE TO SLDR CUP	98291	51-143-0000
L01	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L02	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L03	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L04	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L05	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L06	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L07	147521	COIL ASSY 30-KHZ BANDPASS FILTER		
L08	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L09	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L10	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L11	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L12	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L13	147522	COIL ASSY 1.74-KHZ BANDPASS FILTER		
L14	78716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
L15	78716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
L16	82596	INDUCTOR 18 UH SUBMIN UNSHLD 10%	91637	IR-2
Q01	78215	TRANSSTR 2N5089 NPN SIL	04713	2N5089
R01	84872	RESISTOR 931 OHM RN55C 1% MTL FLM		RN55C9310F
R02	78929	RESISTOR 1.00K OHM RN55C 1% MTL FLM		RN55C1001F
R03	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R04	71913	RESISTOR 270 OHM 1/4W 10% COMP	01121	RCR07G271KS
R05	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R06	83894	RESISTOR 1.78K OHM RN55C 1% MTL FLM		RN55C1781F
R07	83907	RESISTOR 4.22K OHM RN55C 1% MTL FLM		RN55C4221F
R08	83887	RESISTOR 1.27K OHM RN55C 1% MTL FLM		RN55C1271F
R09	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R10	83911	RESISTOR 5.62K OHM RN55C 1% MTL FLM		RN55C5621F
R11	83911	RESISTOR 5.62K OHM RN55C 1% MTL FLM		RN55C5621F
R12	83917	RESISTOR 11.5K OHM RN55C 1% MTL FLM		RN55C1152F
R13	83882	RESISTOR 909 OHM RN55C 1% MTL FLM		RN55C9090F
R14	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R15	71941	RESISTOR 820 OHM 1/4W 10% COMP	01121	RCR07G821KS
R16	78931	RESISTOR 4.99K OHM RN55C 1% MTL FLM		RN55C4991F
R17	78931	RESISTOR 4.99K OHM RN55C 1% MTL FLM		RN55C4991F
R18	83905	RESISTOR 3.65K OHM RN55C 1% MTL FLM		RN55C3651F
R19	84884	POT 5K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66WR5K
R20	78924	RESISTOR 20.0K OHM RN55C 1% MTL FLM		RN55C2002F
R21	85551	POT 5K OHM 1/2W CERMET 20T PC MT 3/8 SQ	73138	66XR5K
R22	72189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R23	71919	RESISTOR 330 OHM 1/2W 10% COMP	01121	RCR20G331KS
R25	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R26	72077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R27	83038	RESISTOR 6.81K OHM RN55C 1% MTL FLM		RN55C6811F
R28	71941	RESISTOR 820 OHM 1/4W 10% COMP	01121	RCR07G821KS
R29	71966	RESISTOR 1.5K OHM 1/4W 10% COMP	01121	RCR07G152KS
R30	71966	RESISTOR 1.5K OHM 1/4W 10% COMP	01121	RCR07G152KS
R31	78058	RESISTOR 150 OHM 1/8W 5% COMP	01121	RCR05G151JS
T01	148527	TRANSFORMER, 302KHZ IF MODULE		
U01	78715	IC DIFF CASCODE RF AMPL	79089	CA3028A
U02	84683	IC CMOS QUAD ANALOG SWITCH	04713	MC14066CL
U03	84683	IC CMOS QUAD ANALOG SWITCH	04713	MC14066CL
U04	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U05	83014	IC CMOS HEX INVERTER/BUFFER	04713	MC14049CL

MODULE ASSY 302 KHZ IF WITH OSCILLATOR - 155596

REF DESIG PREFIX A06

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
U06	84683	IC CMOS QUAD ANALOG SWITCH	04713	MC14066CL
U07	84886	IC OP AMP WIDEBAND 8-PIN DIP	12040	LM318N
U08	81201	IC TTL HEX INVERTER LOW POWER	01295	SN74L04N
U09	85088	IC TTL 4-BIT BINARY COUNTER	01295	SN74LS93N
W01	148746	WIRING HARNESS - 302 KHZ		
Y01	85624	CRYSTAL 4.36364 MHZ .002% SERIES MODE	75378	H3W HOLDER

PWB ASSY, LAMP LOGIC 148748

REF DESIG PREFIX A07

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A 001	0147679	PWR ASSY, INTERLOCK LOGIC		
C 001	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 002	0081210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C 003	0077920	CAPACITR 1 MF 50V CER MONO 20%	80183	5CZ5U105X0050C5
C 004	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 005	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 006	0081210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
J 001	0084571	CONN 28 PIN FEM DOUBLE ROW BOTTOM MT	00779	86418-3
P 001	0084930	CONN HEADER DBL ROW STRAIGHT 20-PIN PC	00779	1-87227-0
P 002	0085128	CONN HEADER DBL ROW STRAIGHT 28-PIN PC	00779	1-87227-4
P 003	0084930	CONN HEADER DBL ROW STRAIGHT 20-PIN PC	00779	1-87227-0
Q 001	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 002	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 003	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 004	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 005	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 006	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 007	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 008	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 009	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
R 001	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 002	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 003	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 004	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 005	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 006	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 007	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 008	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 009	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 010	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 011	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 012	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 013	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 014	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 015	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 016	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 017	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 018	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 019	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 020	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 021	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 022	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 023	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 024	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 025	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
R 026	0078272	RESISTOR 12 OHM 1/8W 5% COMP	01121	RCR05G120JS
R 027	0078070	RESISTOR 4.7K OHM 1/8W 5% COMP	01121	RCR05G472JS
R 028	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 029	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 030	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 031	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 032	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 033	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 034	0079927	RESISTOR 33K OHM 1/8W 5% COMP	01121	RCR05G333JS
U 001	0083012	IC CMOS GATE NAND 4-IN DUAL	04713	MC14012BCL
U 002	0083016	IC CMOS GATE NAND 2-IN QUAD	04713	MC14011BCL
U 003	0083017	IC CMOS GATE NOR 2-IN QUAD	04713	MC14001BCL
U 004	0083011	IC CMOS FLIP-FLOP TYPE-D DUAL	04713	MC14013BCL

PWB ASSY, INTERLOCK LOGIC - 147679

REF DESIG PREFIX A07A01

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
C01	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
J01	84571	CONN RECT 28 PINS PC MT	00779	86418-3
P01	85128	CONN HEADER DBL ROW STRAIGHT 28-PIN PC	00779	1-87227-4
R01	72113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
U01	85131	IC CMOS 8-IN NAND GATE	04713	MC14068CL
U02	85131	IC CMOS 8-IN NAND GATE	04713	MC14068CL
U03	85131	IC CMOS 8-IN NAND GATE	04713	MC14068CL
U04	85131	IC CMOS 8-IN NAND GATE	04713	MC14068CL
U05	85131	IC CMOS 8-IN NAND GATE	04713	MC14068CL
U06	85131	IC CMOS 8-IN NAND GATE	04713	MC14068CL
U07	83014	IC CMOS HEX INVERTER/BUFFER	04713	MC14049CL

REAR PNL, IF/BB ANALYZER MDL 4670-1, ASSY - 147661

REF DESIG PREFIX A08

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A01	147763	RF MODULE INTERFACE PWB ASSY		
B01	76321	FAN 3 IN. SPRITE 115VAC 50/60 HZ	82877	SU2A3
C01	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C02	81101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
F01	71222	FUSE 1 1/2 AMP SLO BLO	75915	3AG
F02	71223	FUSE 2 AMP	75915	3AG
J01	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J02	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J03	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J04	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
J05	85126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
JFL1	83759	CONN AC MALE 3-COND 3A W/FUSE BLK & FILT		6J4
P01	76320	PLUG FAN	82877	48056
Q01	78017	TRANSSTR 2N3055 NPN SIL TC-3 CASE	13715	2N3055
Q02	75961	TRANSSTR 2N3790 PNP SIL	04713	2N3790
R01	79863	RESISTOR 1.21K OHM RN55C 1% MTL FLM		RN55C1211F
R02	79863	RESISTOR 1.21K OHM RN55C 1% MTL FLM		RN55C1211F
S01	84822	SWITCH TOG DPDT FLAT TCG 5A 120VAC	09353	7201P3YZG
U01	84983	IC VOLTAGE RGLTR POS 5V 3A	12040	LM323K
W15	148663	WIRING HARNESS - RECORDER		
W21	158537	CABLE ASSY - REAR PANEL		
XF02	71244	FUS HLDR BLOCK FOR 3AG OR 3AB	71400	4405
XQ01	85001	SOCKET FOR TO-3 CASE		A1303
XQ02	85001	SOCKET FOR TO-3 CASE		A1303
XU01	85001	SOCKET FOR TO-3 CASE		A1303

FRONT PNL ASSY IF/BB ANALYZER MDL 4671-1 156460

REF DESIG PREFIX A09

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A 007	0148748	PWB ASSY, LAMP LOGIC		
A 012	0148751	PWB ASSY, DISPLAY INTERFACE		
J 001	0085182	CONN 20-PIN FEM DOUBLE ROW BOTTOM MT	00779	86418-1
M 001	0148759	METER, LEVEL - SPEC CONTROL DWG		
S 001	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 002	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 003	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 004	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 005	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 006	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 007	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 008	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 009	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 010	0085120	SWITCH TOG SPDT MOM ON-OFF-MOM ON FLAT	09353	7105P3YZG
S 011	0079108	SWITCH ROT 2P 2-6 POS NSH SUBMIN	71590	PSA-203
W 001	0156134	CABLE RF		
W 016	0154277	FRT PNL INTERFACE WIRING HARNESS 4671-1		

ATTENUATOR LOGIC PWB ASSY - 147739

REF DESIG PREFIX A11

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR02	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR03	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR04	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR05	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR06	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR07	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR08	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR09	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR10	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR11	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR12	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR13	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR14	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR15	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR16	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR17	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR18	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR19	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
CR20	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
J01	84585	CONN HEADER DBL ROW RT ANGLE 10-PIN PC	00779	87230-5
J02	84357	CONN HEADER DBL ROW RT ANGLE 20-PIN PC	00779	1-87230-0
Q01	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q02	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q03	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q04	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q05	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q06	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
R01	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R02	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R03	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R04	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
S01	84984	SWITCH ROT 1P 3 POS NSH	76854	5-11371-347
S02	85121	SWITCH ROT 1P 11 POS NSH 1 SEC 30 DEG	76854	512451349
S03	85122	SWITCH ROT 1P 5 POS NSH 1 SEC 30 DEG	76854	511731346
S04	85121	SWITCH ROT 1P 11 POS NSH 1 SEC 30 DEG	76854	512451349
U01	84959	IC CMOS 4-BIT FULL ADDER	04713	MC14008CL
U02	84688	IC CMOS PRIORITY ENCODER	04713	MC14532CL
U03	84950	RESISTOR NETWORK 13 100K OHM 10% 14 DIP	01121	34A1041
U04	84949	RESISTOR NETWORK 7 100K OHM 10% 14 DIP	01121	34B1041
U05	84959	IC CMOS 4-BIT FULL ADDER	04713	MC14008CL
U06	84688	IC CMOS PRIORITY ENCODER	04713	MC14532CL
U07	84950	RESISTOR NETWORK 13 100K OHM 10% 14 DIP	01121	34A1041

PWB ASSY, DISPLAY INTERFACE 148751

REF DESIG PREFIX A12

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A 001	0147674	DIGITAL DISPLAY CARD PWB ASSY		
C 001	0070518	CAPACITR 100 PF 1KV CER DISC S3N 10%	71590	DD-101
C 002	0081210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C 003	0081210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C 004	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 005	0080139	CAPACITR .1 MF 50V CER MONO -20%+80%	72982	8131-050-651-104Z
C 006	0070644	CAPACITR 15 MF 20V SOLID TANT POL 10%	80183	CS13BE156K
J 001	0084571	CONN 28 PIN FEM DOUBLE ROW BOTTOM MT	00779	86418-3
J 002	0084571	CONN 28 PIN FEM DOUBLE ROW BOTTOM MT	00779	86418-3
J 003	0084571	CONN 28 PIN FEM DOUBLE ROW BOTTOM MT	00779	86418-3
J 004	0085126	CONN HEADER DBL ROW STRAIGHT 10-PIN PC	00779	87227-5
Q 001	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 002	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 003	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 004	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 005	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q 006	0084815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
R 001	0072077	RESISTOR 47K OHM 1/4W 10% COMP	01121	RCR07G473KS
R 002	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 003	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 004	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 005	0072182	RESISTOR 820K OHM 1/4W 10% COMP	01121	RCR07G824KS
R 006	0072189	RESISTOR 1.0 MEG 1/4W 10% COMP	01121	RCR07G105KS
R 007	0072182	RESISTOR 820K OHM 1/4W 10% COMP	01121	RCR07G824KS
R 008	0072113	RESISTOR 100K OHM 1/4W 10% COMP	01121	RCR07G104KS
R 009	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 010	0076277	RESISTOR 12 OHM 1/4W 10% COMP	01121	RCR07G120KS
R 011	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
R 012	0072064	RESISTOR 33K OHM 1/4W 10% COMP	01121	RCR07G333KS
R 013	0076277	RESISTOR 12 OHM 1/4W 10% COMP	01121	RCR07G120KS
R 014	0072002	RESISTOR 4.7K OHM 1/4W 10% COMP	01121	RCR07G472KS
S 001	0085163	SWITCH PUSHB SPDT MOM PC MT	09353	8125V
U 001	0083060	IC CMOS REGISTER 4-BIT SHIFT DUAL	04713	MC14015BCL
U 002	0083060	IC CMOS REGISTER 4-BIT SHIFT DUAL	04713	MC14015BCL
U 003	0083060	IC CMOS REGISTER 4-BIT SHIFT DUAL	04713	MC14015BCL
U 004	0084510	IC CMOS LATCH 4-BIT D QUAD	79089	CD4042BF
U 005	0083060	IC CMOS REGISTER 4-BIT SHIFT DUAL	04713	MC14015BCL
U 006	0083060	IC CMOS REGISTER 4-BIT SHIFT DUAL	04713	MC14015BCL
U 007	0083060	IC CMOS REGISTER 4-BIT SHIFT DUAL	04713	MC14015BCL
U 008	0084510	IC CMOS LATCH 4-BIT D QUAD	79089	CD4042BF
U 009	0087879	IC CMOS MULTI MONO RETRIG DUAL PREC		MC14538BCL
U 010	0083011	IC CMOS FLIP-FLOP TYPE-D DUAL	04713	MC14013BCL
U 011	0083016	IC CMOS GATE NAND 2-IN QUAD	04713	MC14011BCL

DIGITAL DISPLAY CARD PWB ASSY - 147674

REF DESIG PREFIX A12A01

COMP DESIG	S-A PART NO	----------DESCRIPTION----------	FSCM	-----MFR PART NO-----
P01	85128	CONN HEADER DBL ROW STRAIGHT 28-PIN PC	00779	1-87227-4
P02	85128	CONN HEADER DBL ROW STRAIGHT 28-PIN PC	00779	1-87227-4
P03	85128	CONN HEADER DBL ROW STRAIGHT 28-PIN PC	00779	1-87227-4
R01	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R02	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R03	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R04	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R05	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R06	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R07	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R08	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
U01	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U02	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U03	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U04	84817	DISPLAY LED 7 SEG YEL +-1 OVRFL .43 IN.	28480	5082-7662
U05	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U06	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U07	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U08	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U09	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U10	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U11	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U12	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U13	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U14	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U15	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U16	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U17	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U18	84816	DISPLAY LED 7 SEG YEL RHDP .43 IN.	28480	5082-7663
U19	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U20	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U21	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U22	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U23	84947	RESISTOR NETWORK 7 220 OHM 2% 14 DIP	01121	3148221
U24	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U25	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U26	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U27	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U28	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL
U29	83714	IC CMOS BCD-TO-7 SEGMT LATCH/DECODR/DRVR	04713	MC14511CL

MODULE ASSY-BASEBAND LOCAL OSCILLATOR - 156461

REF DESIG PREFIX A13

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR02	83618	DIODE 5082-2800 DET UHF SCHOTTKY	28480	5082-2800
CR03	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR04	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR05	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR06	85003	DIODE MV209 VARACTOR SIL RADIAL LEADS	04713	MV209
CR07	71121	DIODE 1N821 TC REF 6.2V .01% .4W	04713	1N821
CR08	71142	DIODE 1N4154 SIL 25V 150MA	80368	1N4154
C01	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C02	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C03	35654	CAPACITR 10 MF 25V SOLID TANT POL 10%	05397	T362B106K025AS
C04	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C05	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C06	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C07	81101	CAPACITR 1 MF 50V CER MONO 20%	72982	8131-050-651-105M
C08	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C09	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C10	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C11	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C12	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C13	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C14	82004	CAPACITR 3.3 PF 100V CER DISC	72982	835-024-COJO-339C
C15	81746	CAPACITR 1 PF 500V CER DISC	72982	831-COKO-109C
C16	73492	CAPACITR 15 PF 500V SILVER MICA 5%	00656	ADM15C150J500
(1) C16	77955	CAPACITR 3PF 500V SILVER MICA +-1PF	14655	CD6CD030C03
C17	79143	CAPACITR 2-8 PF MIN CER DISC PC MT	72982	538-011 A 2-8
C18	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C19	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C20	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C21	70470	CAPACITR 10 PF 500V SILVER MICA 5%	14655	CD15CD100J03
C22	70492	CAPACITR 33 PF 500V SILVER MICA 5%	14655	CD15ED330J03
C23	81971	CAPACITR 2.2 PF 100V CER DISC	72982	835-024-COJO229C
C24	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C25	35656	CAPACITR 100 MF 20V SOLID TANT POL 10%	05397	T362D107K020AS
C26	81995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C27	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C28	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C29	80139	CAPACITR .1 MF 50V CER MONO	72982	8131-050-651-104Z
C30		NOT ASSIGNED		
C31	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C32	81995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C33	81995	CAPACITR .001 MF 100V CER MONO X7R 10%	72982	8121-100-X7R-102K
C34	81210	CAPACITR .01 MF 50V CER MONO X7R 10%	72982	8121-050-X7R-103K
C35	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C36	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C37	77863	CAPACITR .001 MF 500V FDTHRU THD GMV	33095	54-804-002-102P
C38	147538	CONDENSER, LO MODULE SOURCE CONTROL DWG		
C39	81792	CAPACITR 30 PF CER DISC	72982	805-024-U1GO-300J
C40	35656	CAPACITR 100 MF 20V SOLID TANT POL 10%	05397	T362D107K020AS
C41	35656	CAPACITR 100 MF 20V SOLID TANT POL 10%	05397	T362D107K020AS
E01		NOT ASSIGNED		
E02		NOT ASSIGNED		
E03		NOT ASSIGNED		
E04	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E05	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E06	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E08	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
E09	81718	CORE BEAD FERRITE 7D .138X.037X.150L	78488	57-1413
J01	84937	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-145-0000
J02	84937	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-145-0000
J03	85125	CONN HEADER DBL ROW STRAIGHT 4-PIN PC	00779	87227-2
J04	84937	CONN COAX CONHX SNAP-ON MALE TC SLDR CUP	98291	51-145-0000
K01	85285	RELAY 12VDC TO-5 PKG		732-12

(1) APPLIES TO SERIAL NUMBER 321 THROUGH 357 (APPROXIMATELY).

MODULE ASSY-BASEBAND LOCAL OSCILLATOR - 156461

REF DESIG PREFIX A13

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
L01	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L2	173666	INDUCTOR .23 UH SILVER ON CERAMIC PC 5%		208702782
(2) L02	80331	INDUCTOR .25 UH MIN MET ON GLASS PC MT	73899	LF2W025
L03	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L04	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L5	173667	INDUCTOR .32 UH SILVER ON CERAMIC PC 5%		508702783
(2) L05	79898	INDUCTOR .30 UH MIN MET ON GLASS PC MT	73899	LF2W030
L06	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L07	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L08	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L09	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L10	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L11	79926	INDUCTOR 10 UH SUBMIN UNSHLD 10%	91637	IR-2
L12	82597	INDUCTOR 22 UH SUBMIN UNSHLD 10%	91637	IR-2
L13	78716	INDUCTOR 100 UH SUBMIN UNSHLD 10%	91637	IR-2
L14	82592	INDUCTOR .56 UH SUBMIN UNSHLD 10%	91637	IR-2
L15	79093	INDUCTOR 510 UH MIN SHLD ENCAP 5%	72259	WEE-510
L16	79093	INDUCTOR 510 UH MIN SHLD ENCAP 5%	72259	WEE-510
L17	73318	WIRE 22 BUS	70903	8021
Q01	84815	TRANSSTR 2N6427 NPN SIL DARLINGTON PAIR	04713	2N6427
Q02	78215	TRANSSTR 2N5089 NPN SIL	04713	2N5089
Q03	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q04	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q05	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q06	77147	TRANSSTR 2N3947 NPN SIL	04713	2N3947
Q07	79329	TRANSSTR 2N5109 NPN SIL	79089	2N5109
R01	83957	RESISTOR 215K OHM RN55C 1% MTL FLM		RN55C2153F
R02	71960	RESISTOR 1.2K OHM 1/4W 10% COMP	01121	RCR07G122KS
R03	78928	RESISTOR 100K OHM RN55C 1% MTL FLM		RN55C1003F
R04	78928	RESISTOR 100K OHM RN55C 1% MTL FLM		RN55C1003F
R05	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R06	78928	RESISTOR 100K OHM RN55C 1% MTL FLM		RN55C1003F
(2) R07	80242	RESISTOR 90.9K OHM RN60C 1% MTL FLM		RN60C9092F
R07	83942	RESISTOR 75.0K OHM RN55C 1% MTL FLM		RN55C7502F
(3) R07	79654	RESISTOR 84.5K OHM RN60D 1% MTL FLM		RN60D8452F
R08	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R09	72039	RESISTOR 15K OHM 1/4W 10% COMP	01121	RCR07G153KS
R10	71907	RESISTOR 220 OHM 1/4W 10% COMP	01121	RCR07G221KS
R11		NOT ASSIGNED		
R12	72068	RESISTOR 39K OHM 1/4W 10% COMP	01121	RCR07G393KS
R13	72046	RESISTOR 18K OHM 1/4W 10% COMP	01121	RCR07G183KS
R14	71897	RESISTOR 150 OHM 1/4W 10% COMP	01121	RCR07G151KS
R15	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R16	71887	RESISTOR 100 OHM 1/4W 10% COMP	01121	RCR07G101KS
R17	71960	RESISTOR 1.2K OHM 1/4W 10% COMP	01121	RCR07G122KS
R18	79010	RESISTOR 590 OHM RN55C 1% MTL FLM		RN55C5900F
R19	71941	RESISTOR 820 OHM 1/4W 10% COMP	01121	RCR07G821KS
R20	79123	RESISTOR 301 OHM RN55C 1% MTL FLM		RN55C3010F
R21	83089	RESISTOR 75.0 OHM RN55C 1% MTL FLM		RN55C75R0F
R22	78457	RESISTOR 590 OHM RN60C 1% MTL FLM		RN60C5900F
R23	83801	RESISTOR 150 OHM RN55C 1% MTL FLM		RN55C1500F
R24	83801	RESISTOR 150 OHM RN55C 1% MTL FLM		RN55C1500F
R25	72034	RESISTOR 12K OHM 1/4W 10% COMP	01121	RCR07G123KS
R26	71977	RESISTOR 2.2K OHM 1/4W 10% COMP	01121	RCR07G222KS
R27	72014	RESISTOR 6.8K OHM 1/4W 10% COMP	01121	RCR07G682KS
R28	72026	RESISTOR 10K OHM 1/4W 10% COMP	01121	RCR07G103KS
R29	78417	RESISTOR 140K OHM RN55C 1% MTL FLM		RN55C1403F
R30	71951	RESISTOR 1.0K OHM 1/4W 10% COMP	01121	RCR07G102KS
R31	78933	RESISTOR 10.0K OHM RN55C 1% MTL FLM		RN55C1002F
R32	78700	FACTORY SELECTED VALUE		
U01	81840	IC OP AMP 8PIN DIP INT.COMP. DUAL 741C	79089	CA1458G
U02	84890	IC OP AMP GEN PUR +70C 8-PIN DIP 741C	04713	MC1741CP1
W01	150465	WIRING HARNESS ASSY - 88 LC		
W18	148660	WIRING HARNESS - 88 LC		

(2) APPLIES TO SERIAL NUMBER 412 AND BELOW (APPROXIMATELY).

(3) APPLIES TO SERIAL NUMBER 413 THROUGH 428 (APPROXIMATELY).

FSCM-MANUFACTURER CROSS REFERENCE

FSCM	MANUFACTURER	CITY	STATE
00656	AEROVOX CORPORATION	NEW BEDFORD	MASS
00779	AMP INC	HARRISBURG	PA
01121	ALLEN-BRADLEY CO	MILWAUKEE	WISC
01295	TEXAS INSTRUMENTS INC	DALLAS	TEXAS
02111	SPECTROL ELECTRONICS CORP	SAN GABRIEL	CALIF
02113	COILCRAFT	CARY	ILL
04713	MOTOROLA SEMICONDUCTOR PDTS	PHOENIX	ARIZ
05397	KEMET DIV-UNION CARBIDE	CLEVELAND	OHIO
09021	AIRCO SPEER ELEC COMPONENTS	DUBOIS	PA
09353	C&K COMPONENTS, INC	NEWTON	MASS
12040	NATIONAL SEMICONDUCTOR CORP	DANBURY	CONN
13715	FAIRCHILD SEMICONDUCTOR CORP	SAN RAFAEL	CALIF
13919	BURR-BROWN RESEARCH CORP	TUSCON	ARIZ
14655	CORNELL-DUBILIER ELEC CORP	S PLAINFIELD	N J
15801	FENWAL ELECTRONICS	FRAMINGHAM	MASS
18796	ERIE TECHNOLOGICAL PRODUCTS INC--TECH MATLS DIV	STATE COLLEGE	PA
24446	GENERAL ELECTRIC CO	SCHENECTADY	N Y
24681	MEMCOR INC COMPONENTS DIV /TRU-OHM/	HUNTINGTON	IND
27073	SENTRY MFG	OKLAHOMA CITY	OKLA
28480	HEWLETT-PACKARD	PALO ALTO	CALIF
32293	INTERSIL INC	CUPERTINO	CA
33095	SPECTRUM CONTROL INC	FAIRVIEW	PA
53021	SANGAMO ELECTRIC CO	SPRINGFIELD	ILL
61637	UNION CARBIDE CORP	NEW YORK	N Y
71279	CAMBION-DIV CAMBRIDGE THERMNIC	CAMBRIDGE	MASS
71400	BUSSMAN MANUFACTURING	ST LOUIS	MO
71450	CTS CORP	ELKHART	IND
71590	CENTRALAB	MILWAUKEE	WISC
71785	CINCH MANUFACTURING CO	CHICAGO	ILL
72136	ELECTRO MOTIVE MFG	WILLIAMANTIC	CONN
72259	NYTRONICS INC	BERKELEY HTS	N J
72982	ERIE RESISTOR CORP	ERIE	PA
73138	HELIPOT-DIV BECKMAN INSTR	FULLERTON	CALIF
73899	JFD ELECTRONICS CORP	BROOKLYN	N Y
75378	CTS KNIGHTS INC	SANDWICH	ILL
75915	LITTELFUSE INC	DES PLAINES	ILL
76493	MILLER J W CO	LOS ANGELOS	CALIF
76854	OAK MFG-DIV OAK ELECTRO/NETICS	CRYSTAL LAKE	ILL
78488	STACKPOLE CARBON CO-MAGNET DIV	ST MARYS	PENN
79089	RADIO CORP OF AMERICA	HARRISON	N J
80183	SPRAGUE PDTS CO	N ADAMS	MASS
80294	BOURNS LABORATORIES INC	RIVERSIDE	CALIF
80368	SYLVANIA ELECTRIC PDTS INC	NEW YORK	N Y
82877	ROTRON MFG CO	WOODSTOCK	N Y
83003	VARO INC	GARLAND	TEXAS
84411	TRW CAPACITOR DIV /GOOD-ALL/	OGALLALA	NEBR
91637	DALE PRODUCTS INC	COLUMBUS	NEB
98291	SEALECTRO CORP	MAMARONECK	N Y

CHAPTER 7
DIAGRAMS

7.1 GENERAL

7.1.1 The diagrams contained in this chapter are provided for both detailed troubleshooting if a malfunction should occur and as a training aid for maintenance personnel who will be responsible for the care and operation of the Model 4671 IF/Baseband Analyzer.

7.2 ARRANGEMENT OF DIAGRAMS

7.2.1 The diagrams are arranged using the alpha-numeric designations assigned to the sub-assemblies of the Model 4671 IF/Baseband Analyzer. Diagrams associated with the Model 4673 X-Y Recorder will be found in the separate manual dedicated to the X-Y Recorder.

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7.3.1 The schematic and assembly diagrams contained in this chapter are arranged as follows:

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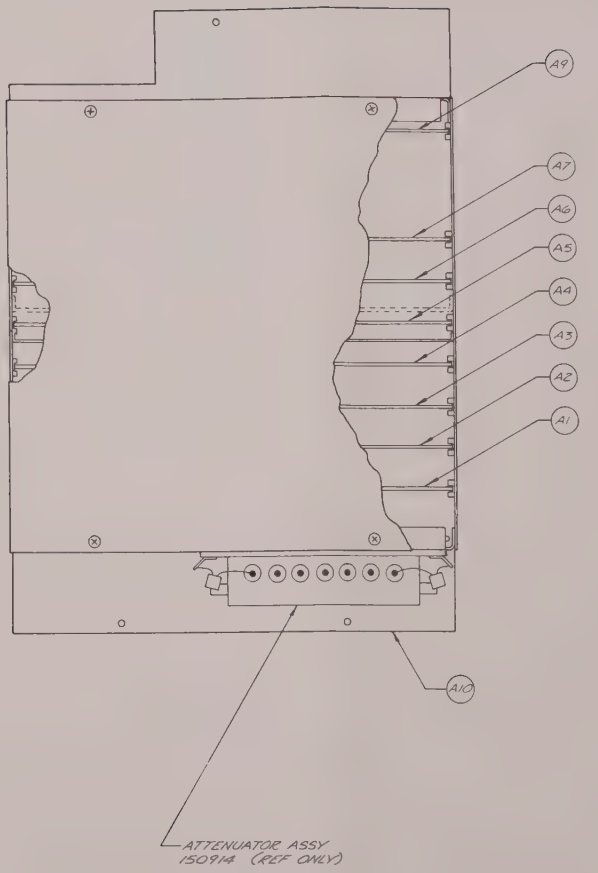


Figure 7-1. Model 4671 IF/Baseband Analyzer, Printed Circuit Board Locations

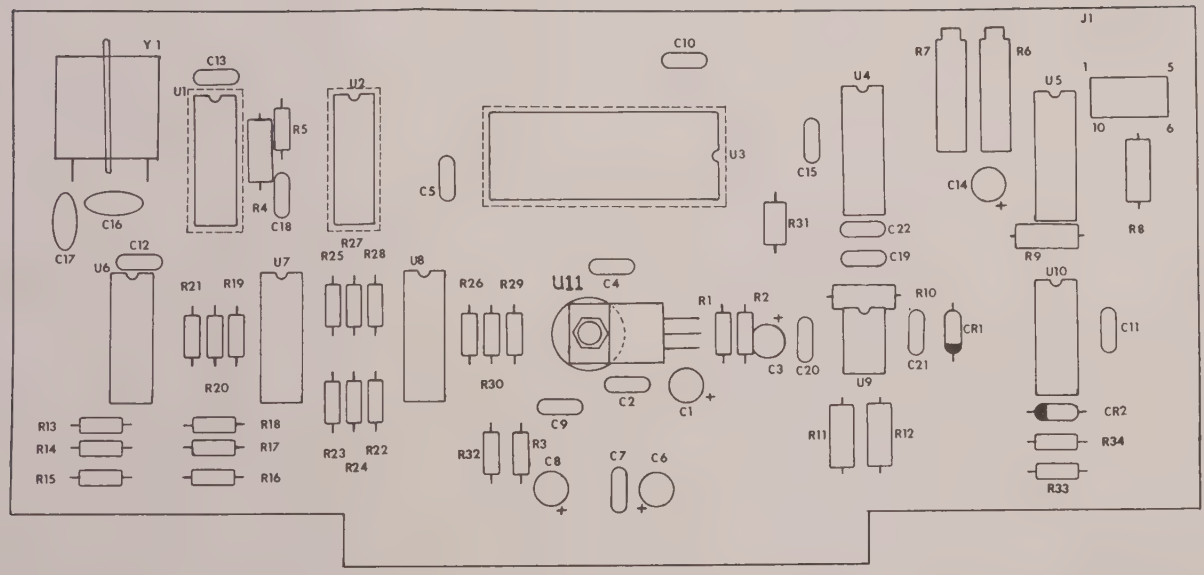


Figure 7-2. A/D Converter and Arithmetic Printed Circuit Board (A1A1), Component Location

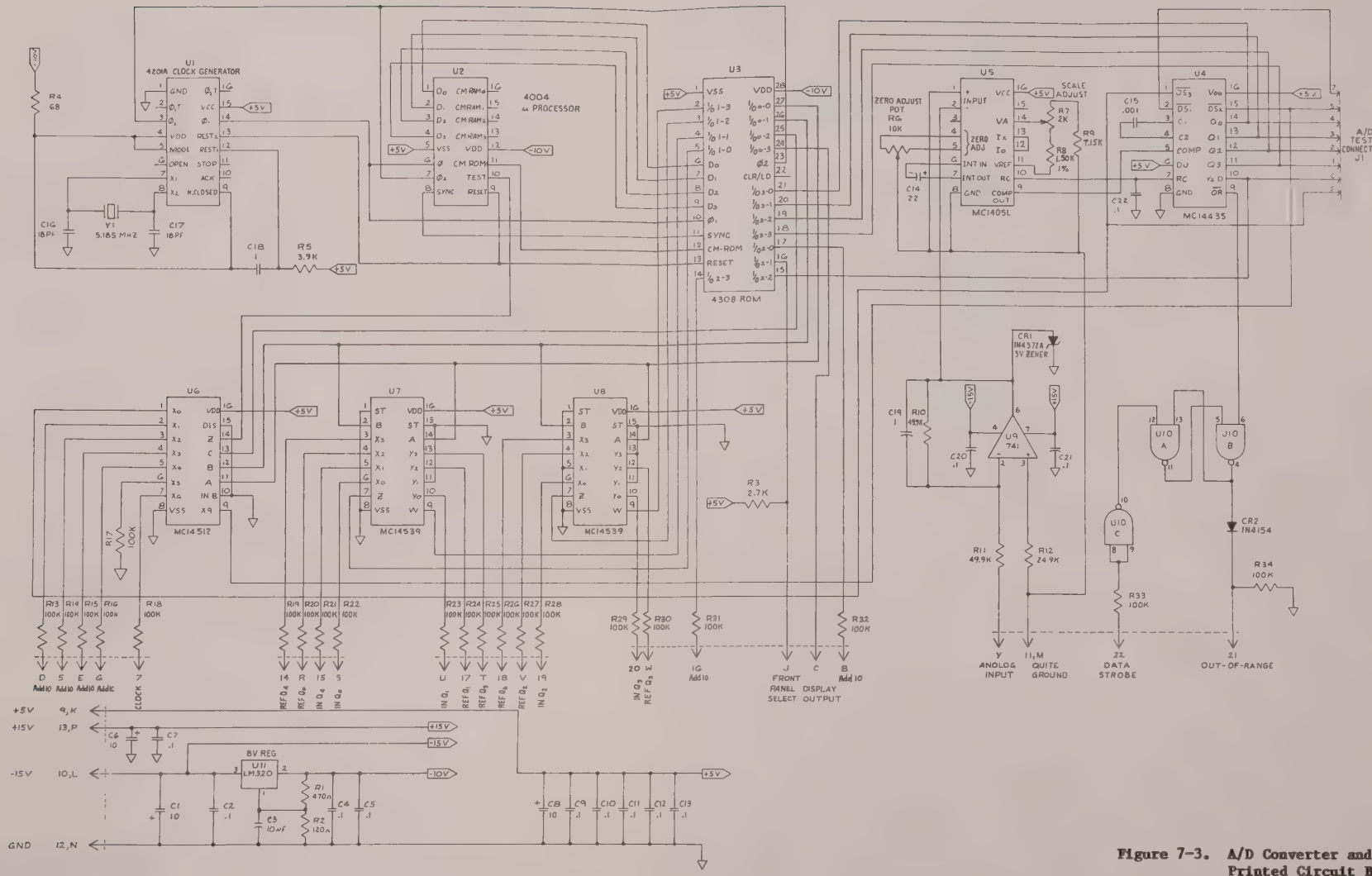


Figure 7-3. A/D Converter and Arithmetic Printed Circuit Board (A1A1), Schematic

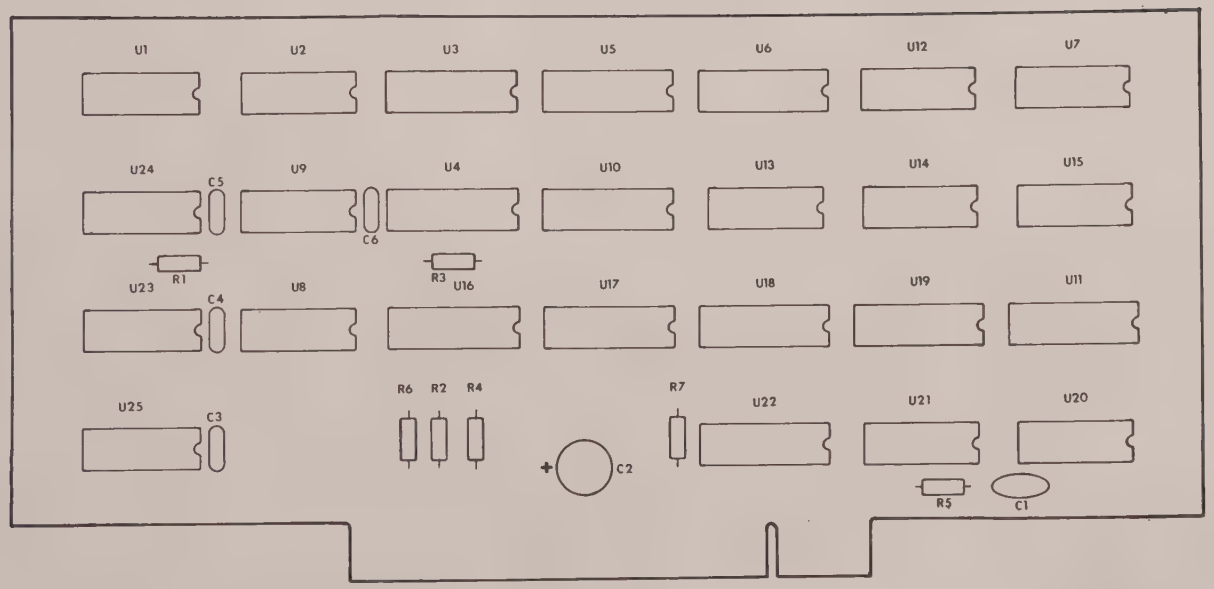


Figure 7-4. Counter Printed Circuit Board (A1A2), Component Location

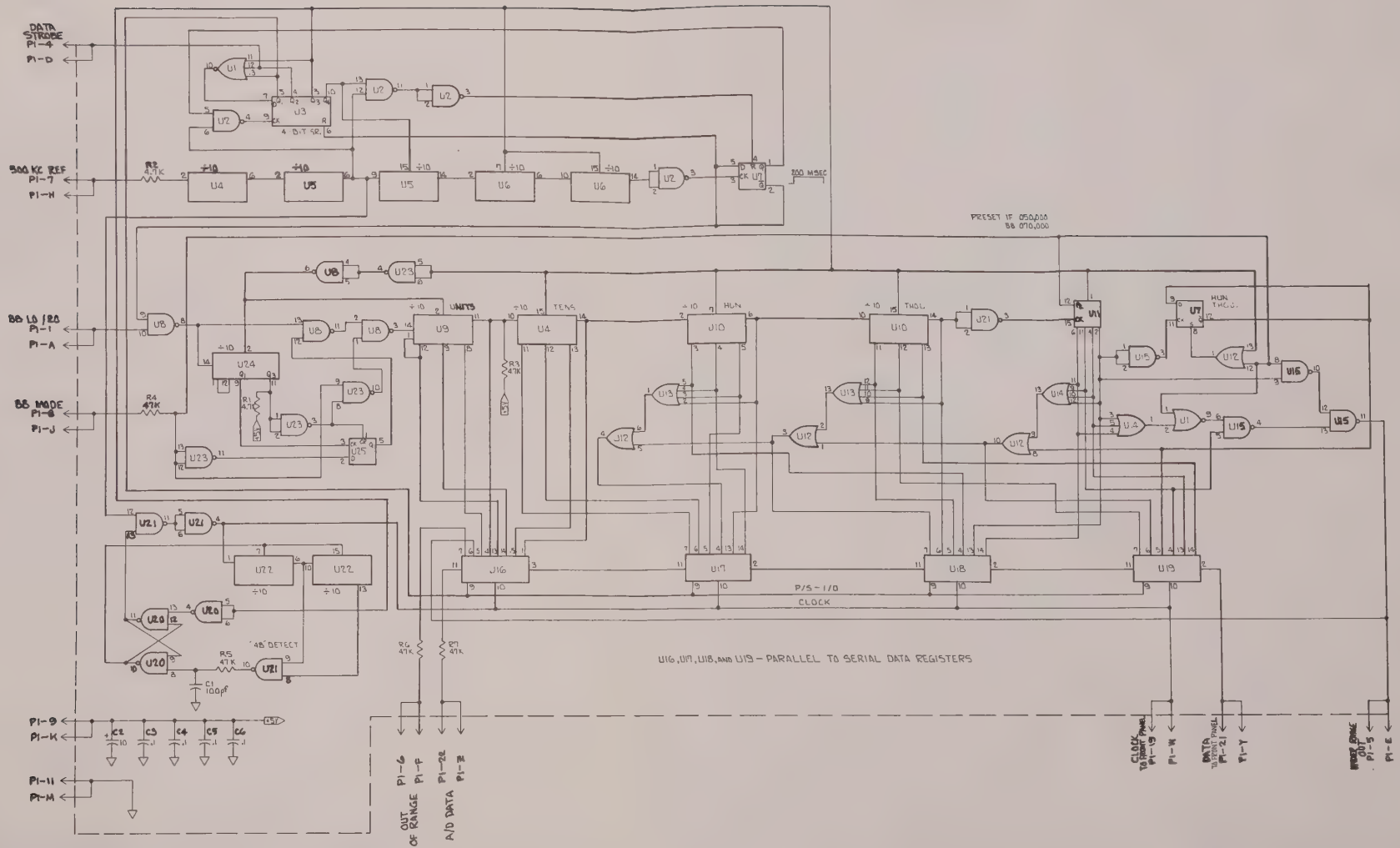


Figure 7-5. Counter Printed Circuit Board (A1A2), Schematic

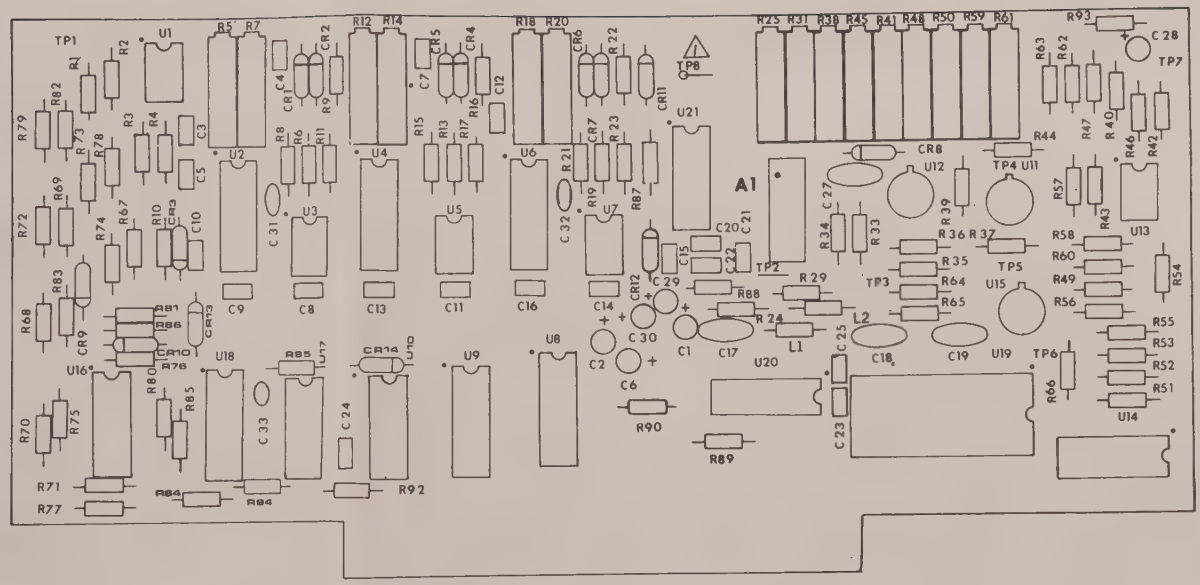


Figure 7-6. Auto Range and Log Amplifier Printed Circuit Board (A1A3), Component Location

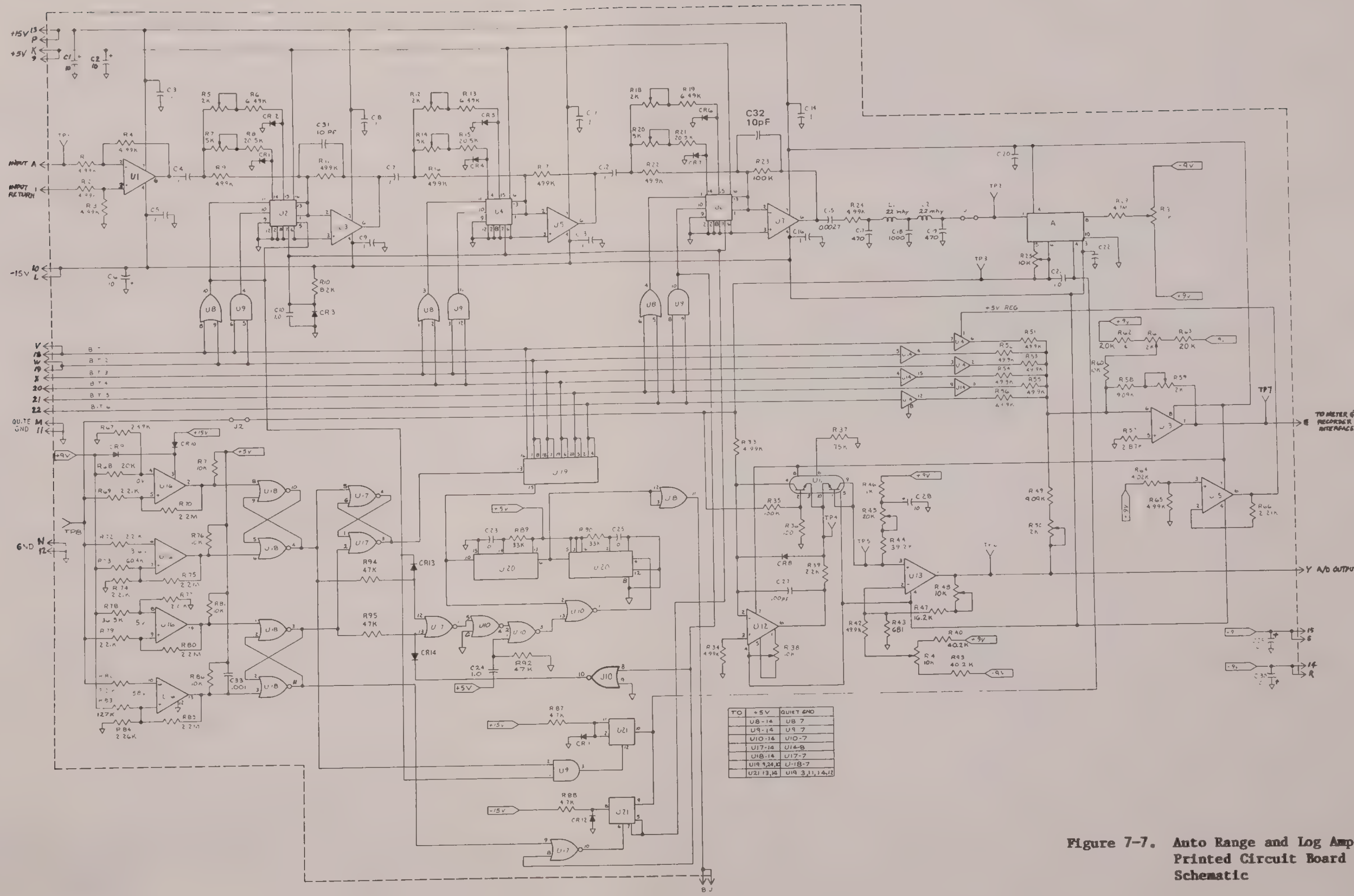


Figure 7-7. Auto Range and Log Amplifier Printed Circuit Board (A1A3), Schematic

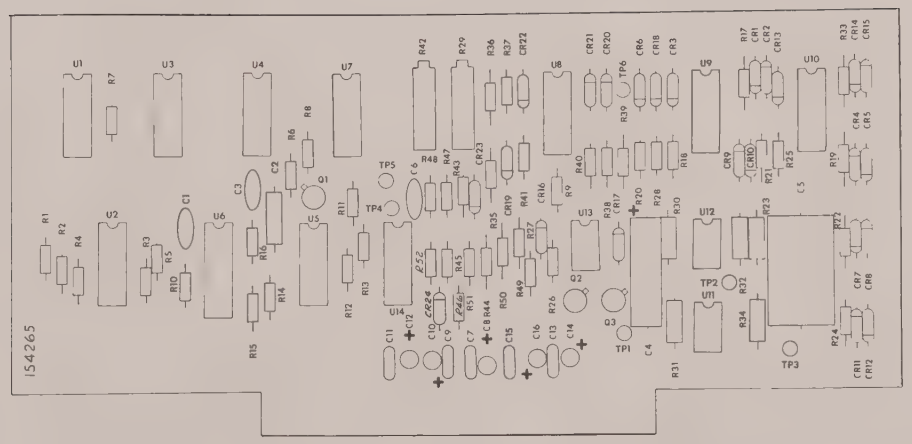
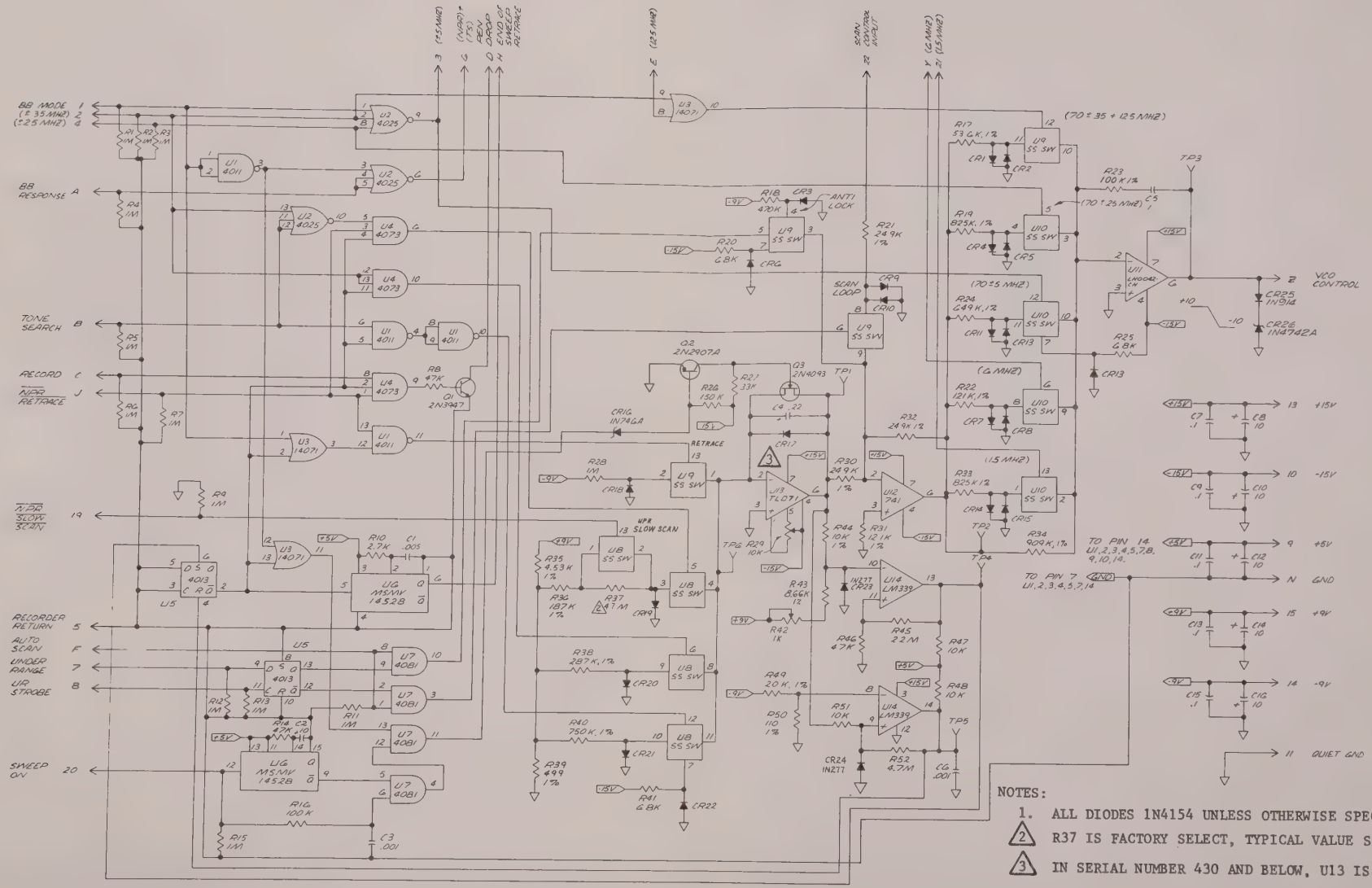


Figure 7-8. Sweep Generator and Mode Logic Printed Circuit Board (A1A4), Component Location



NOTES:

1. ALL DIODES 1N4154 UNLESS OTHERWISE SPECIFIED.
2. R37 IS FACTORY SELECT, TYPICAL VALUE SHOWN.
3. IN SERIAL NUMBER 430 AND BELOW, U13 IS A LH0042.

Figure 7-9. Sweep Generator and Mode Logic Printed Circuit Board (A1A4), Schematic

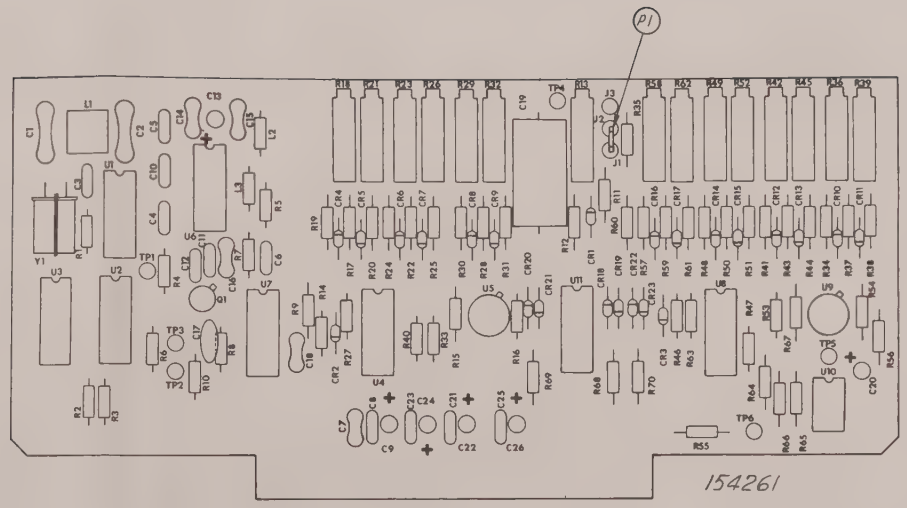


Figure 7-10. Scan Control Printed Circuit Board (A1A5), Component Location

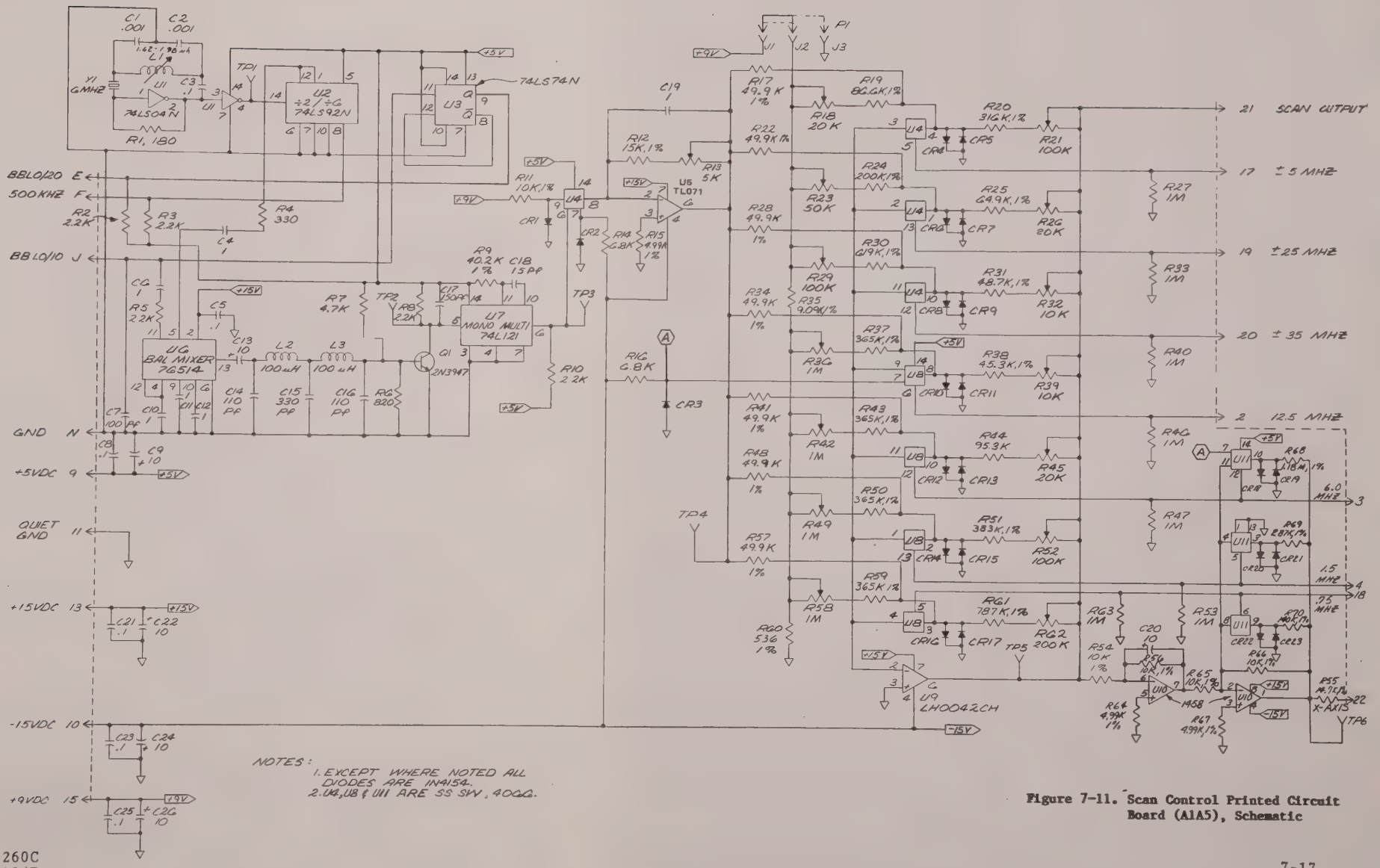


Figure 7-11. Scan Control Printed Circuit Board (A1A5), Schematic

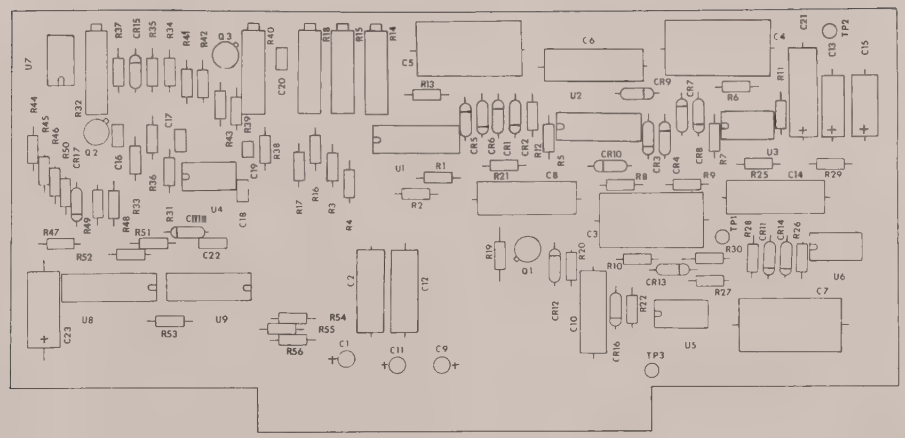


Figure 7-12. Meter and Recorder Interface Printed Circuit Board (A1A6), Component Location

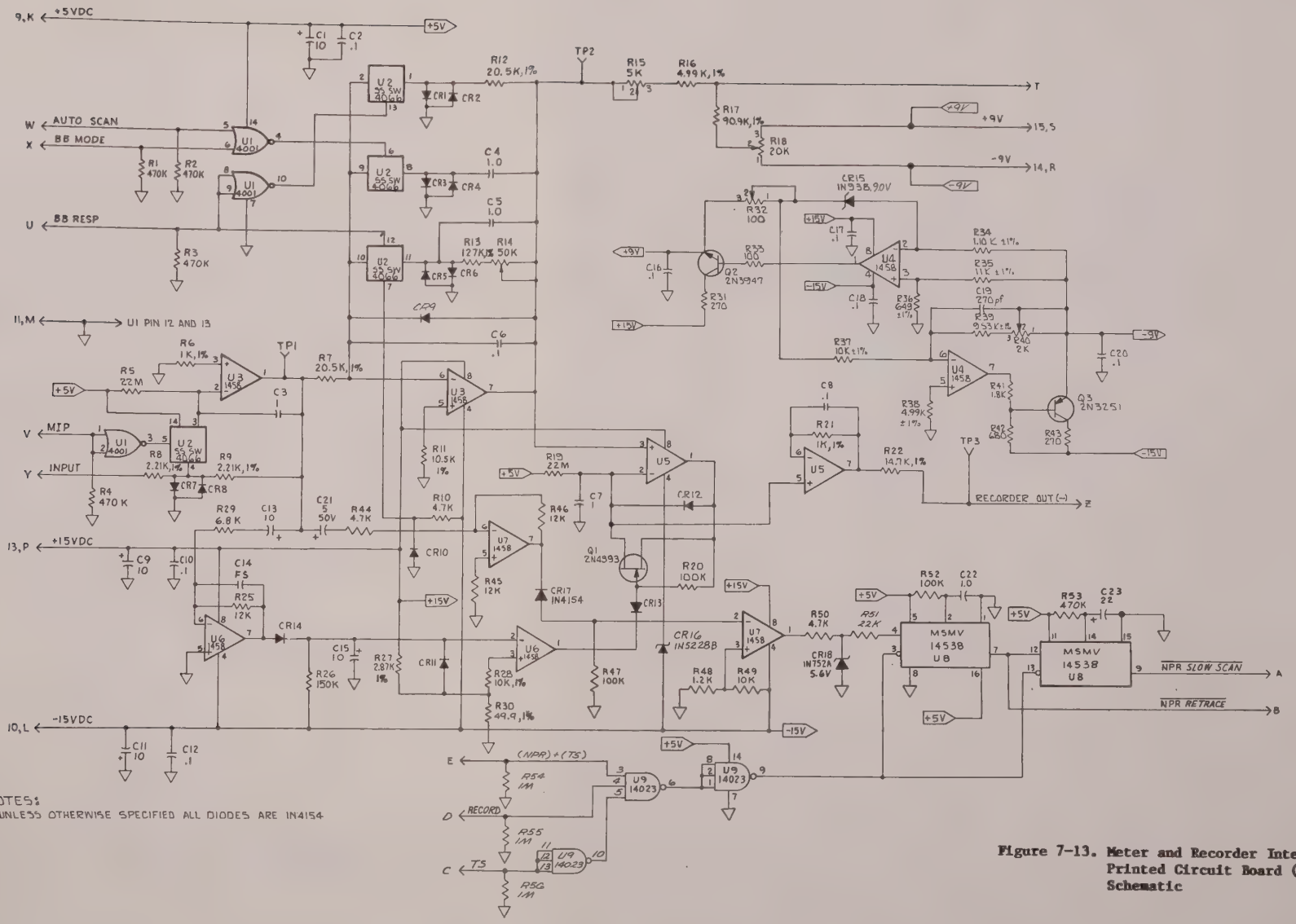


Figure 7-13. Meter and Recorder Interface Printed Circuit Board (A1A6), Schematic

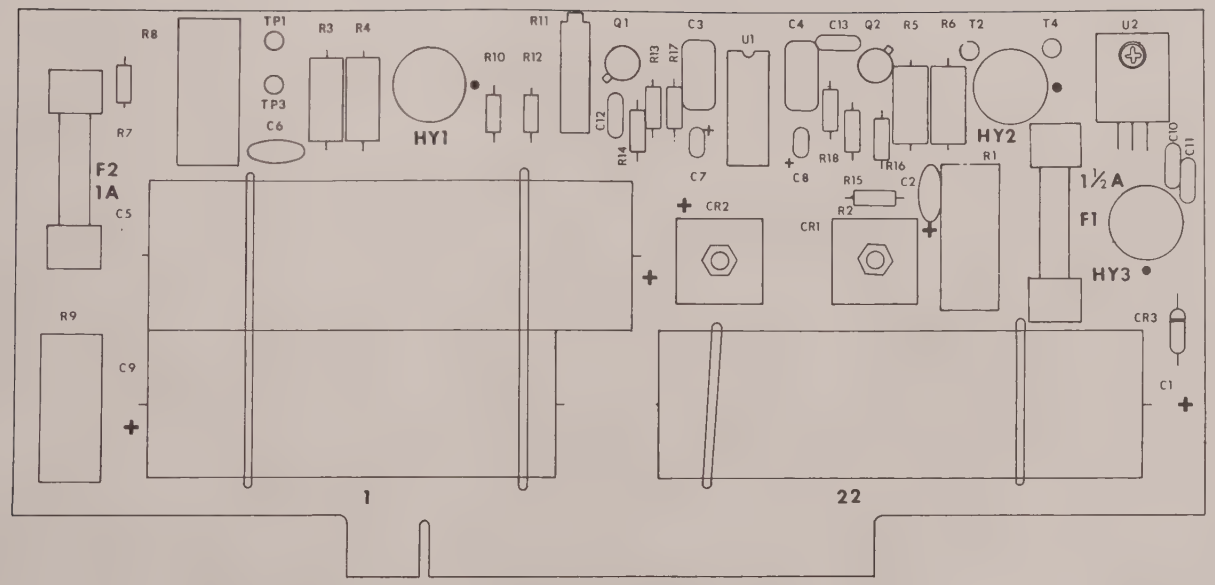


Figure 7-14. Power Supply Printed Circuit Board (A1A9), Component Location

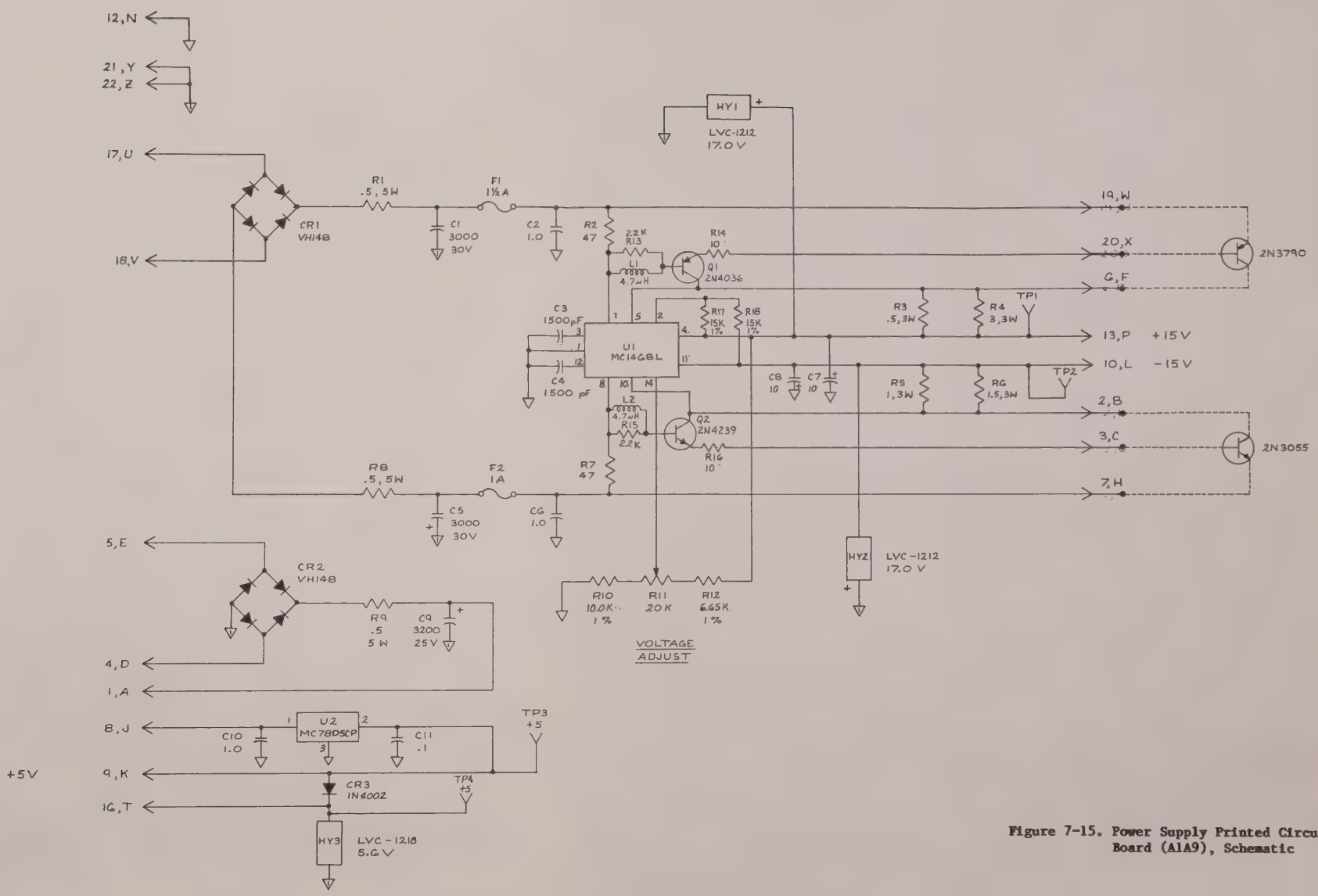


Figure 7-15. Power Supply Printed Circuit Board (A1A9), Schematic

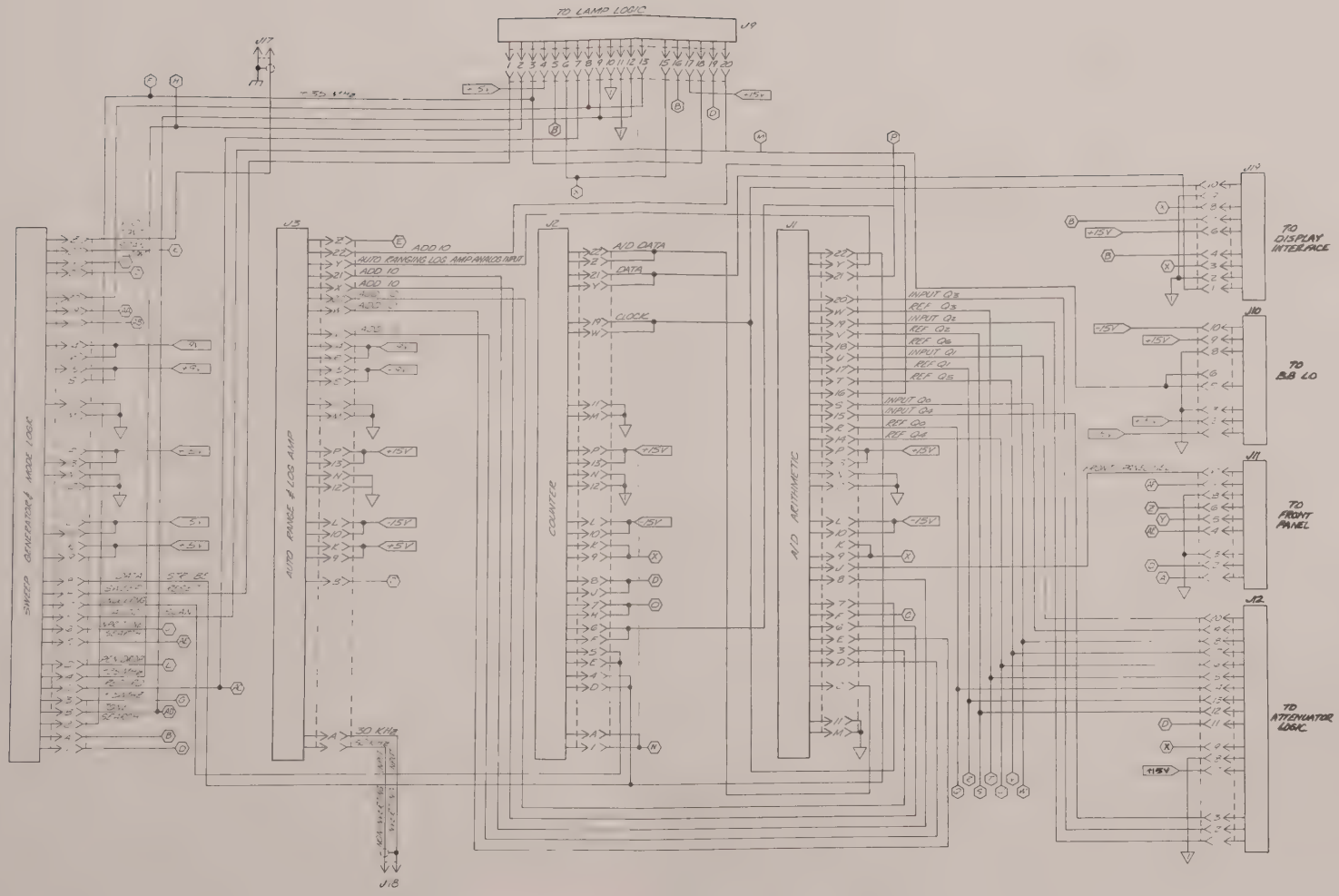


Figure 7-16. Motherboard Printed Circuit Board (A1A10), Schematic (Sheet 1 Of 2)

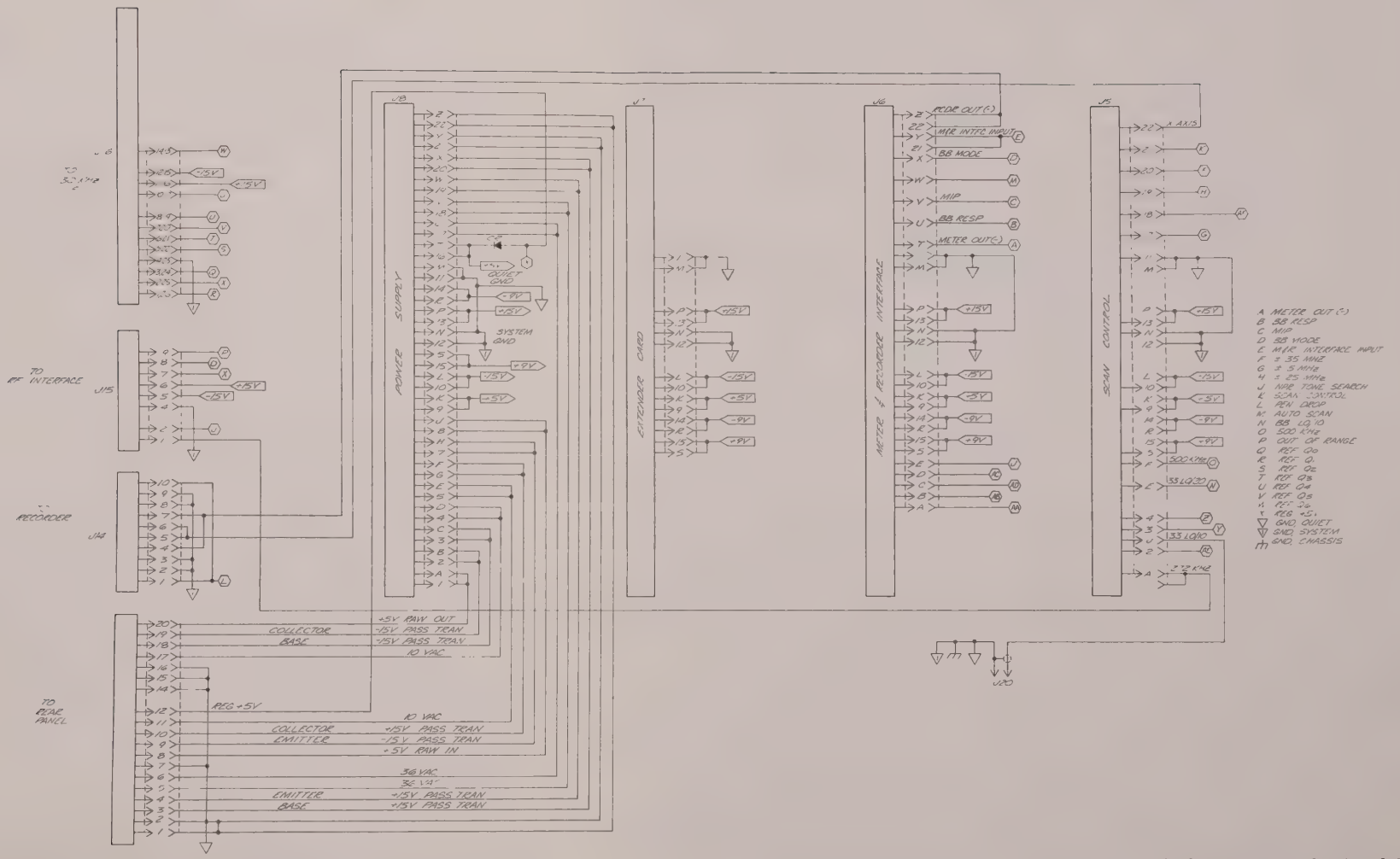


Figure 7-16. Motherboard Printed Circuit Board (A1A10), Schematic (Sheet 2 of 2)

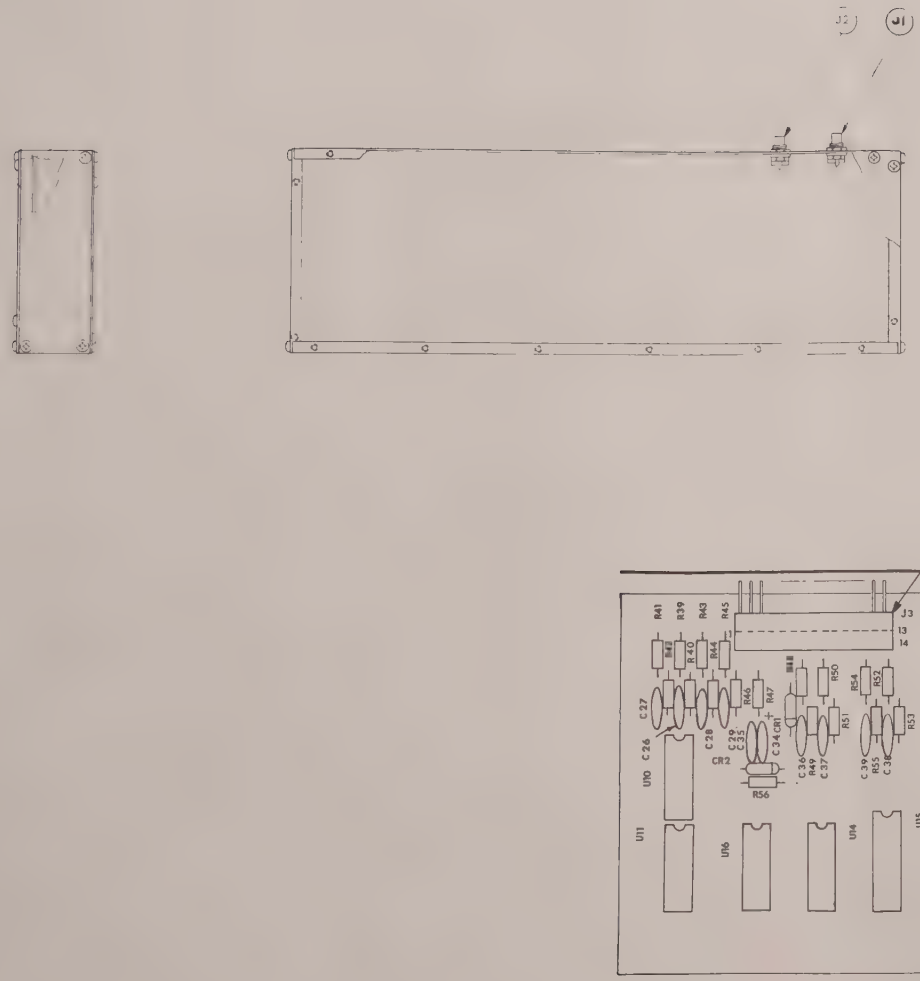


Figure 7-17. 30 kHz IF Module (A2), Component Location

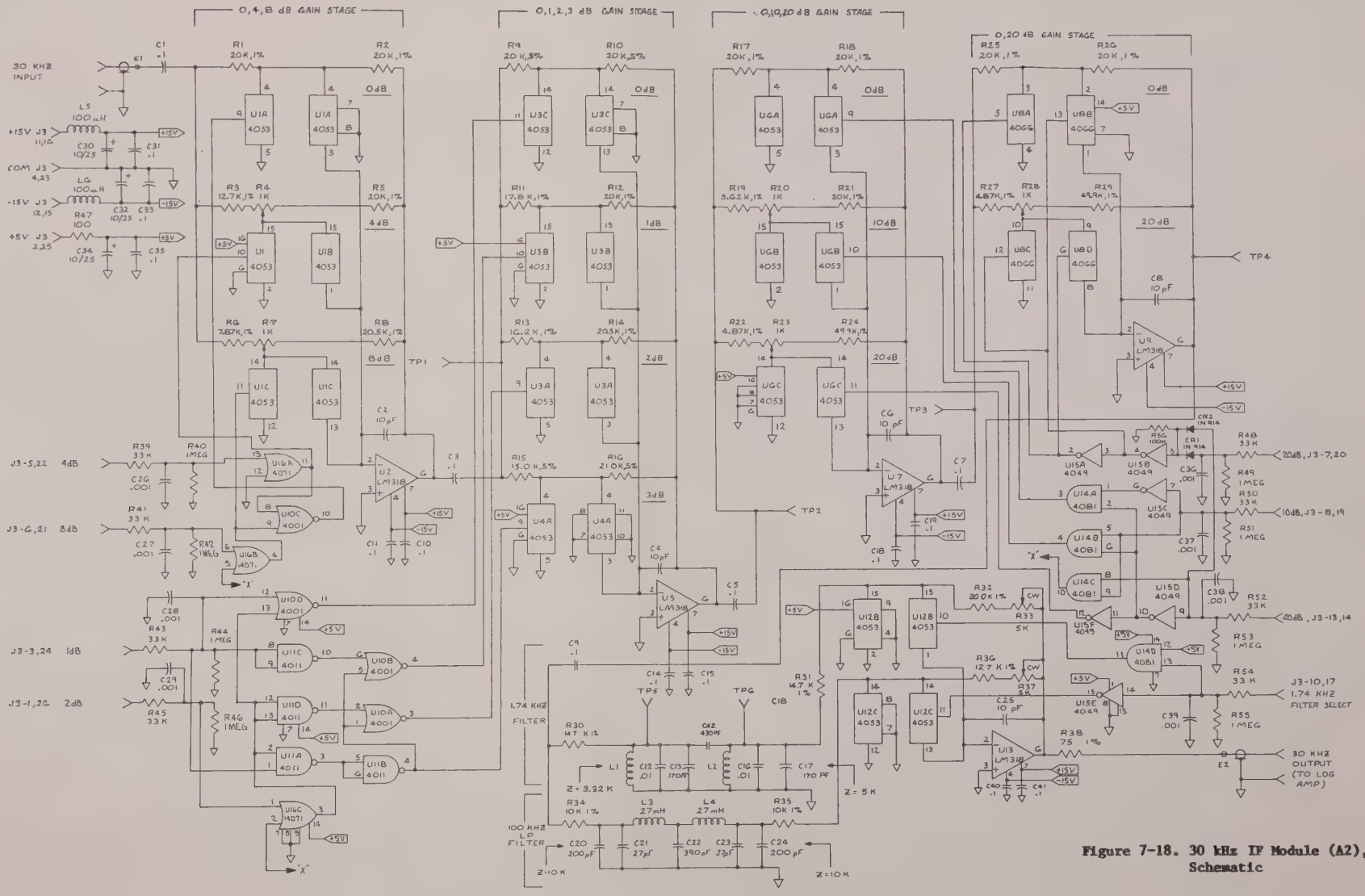


Figure 7-18. 30 kHz IF Module (A2), Schematic

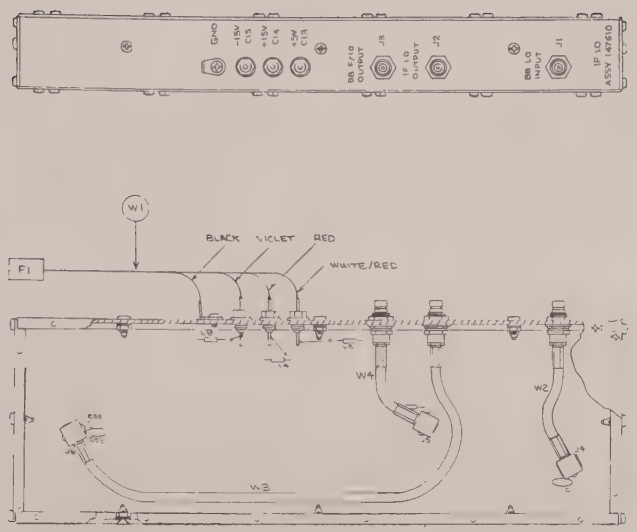


Figure 7-19. IF LO Module (A3), Component Location

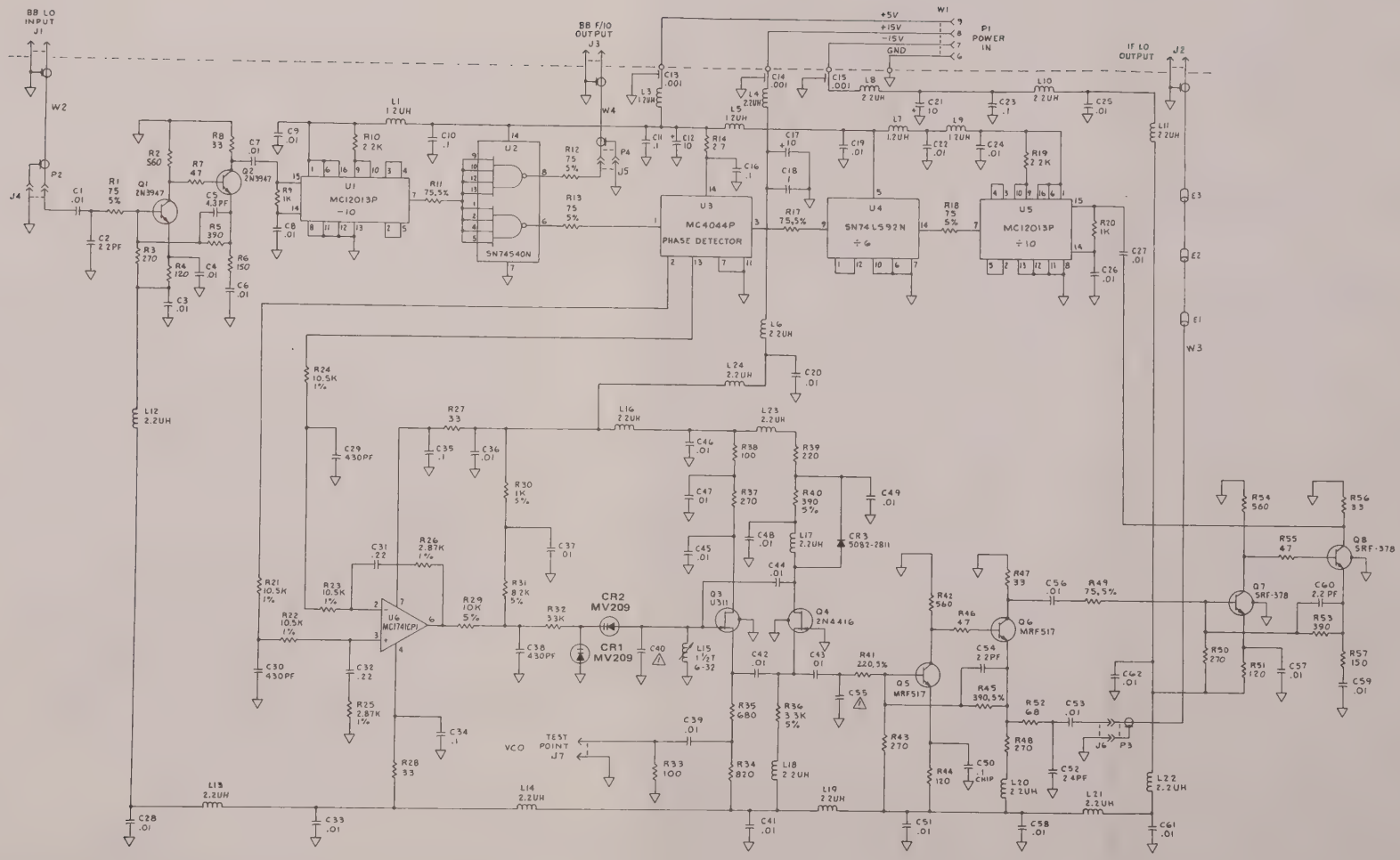


Figure 7-20. IF LO Module (A3), Schematic

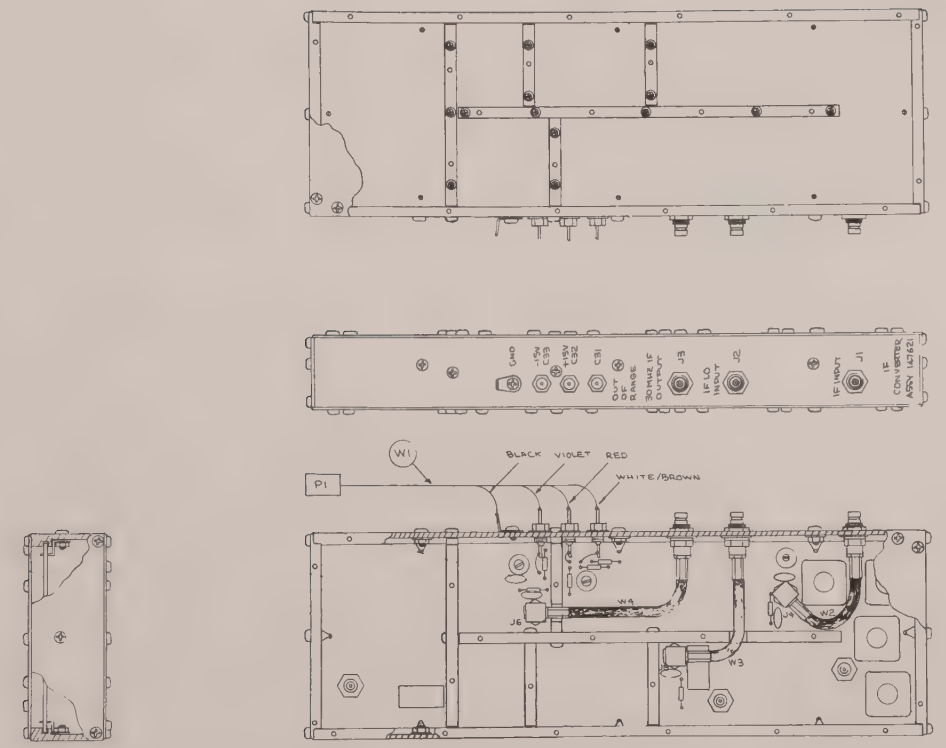
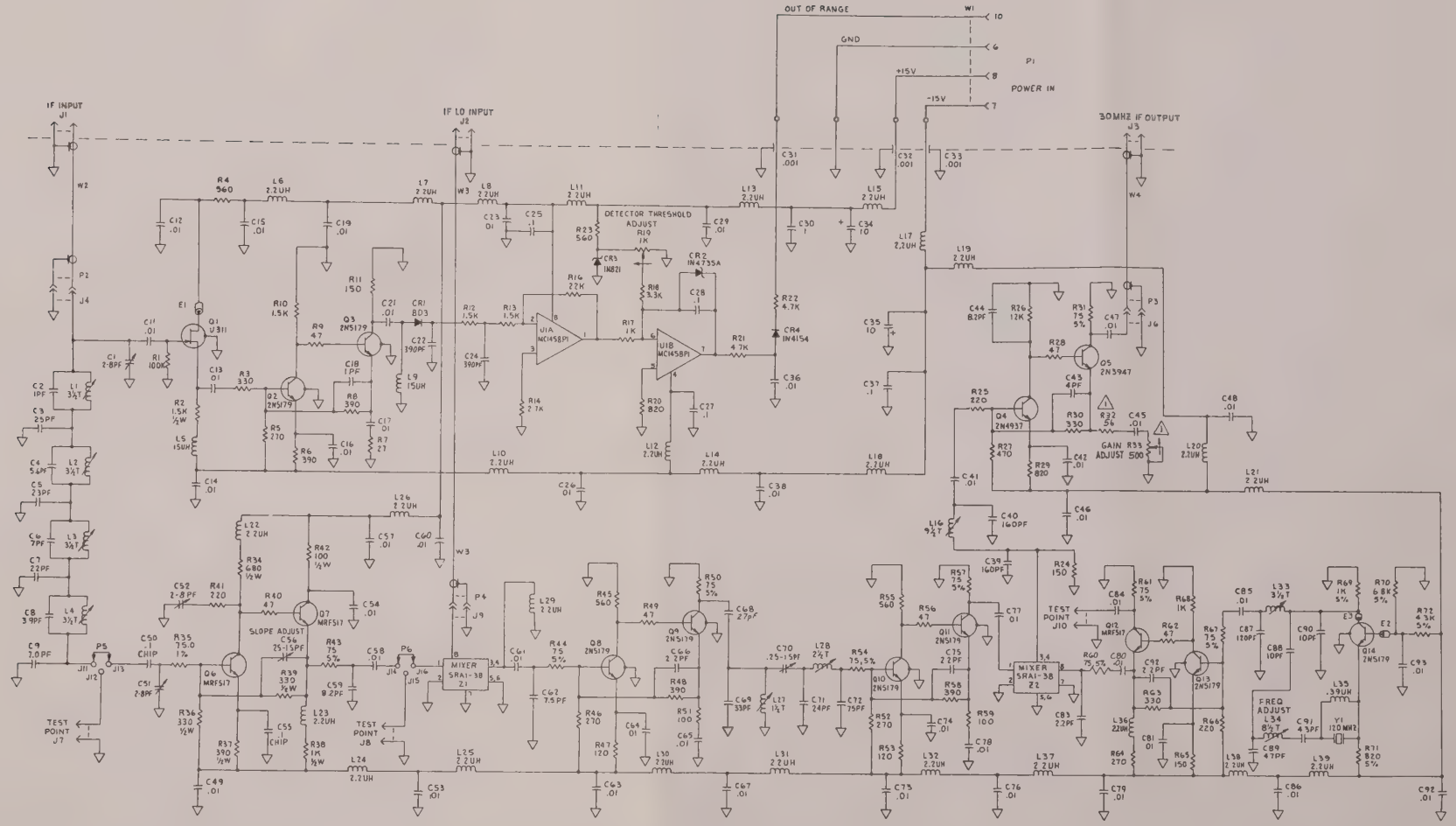
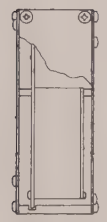


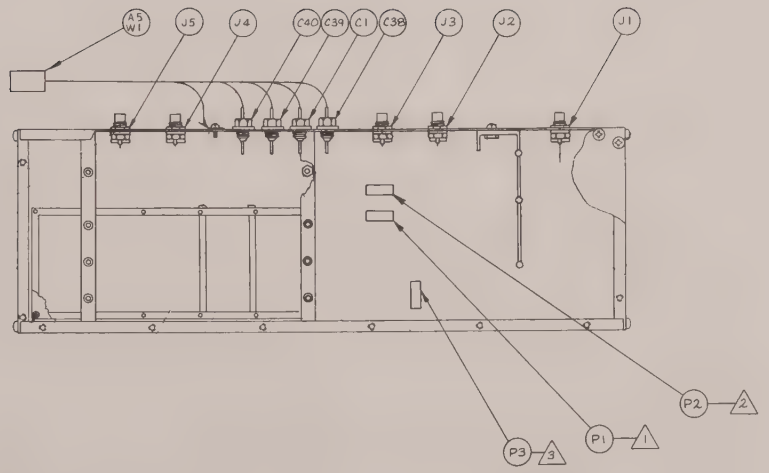
Figure 7-21. IF Converter Module (A4), Component Location



⚠ R32 VLAUE IS 82 OHM AND R33 VALUE IS 250 OHM ON SERIAL NUMBER 350 AND BELOW (APPROXIMATELY).

Figure 7-22. IF Converter Module (A4), Schematic

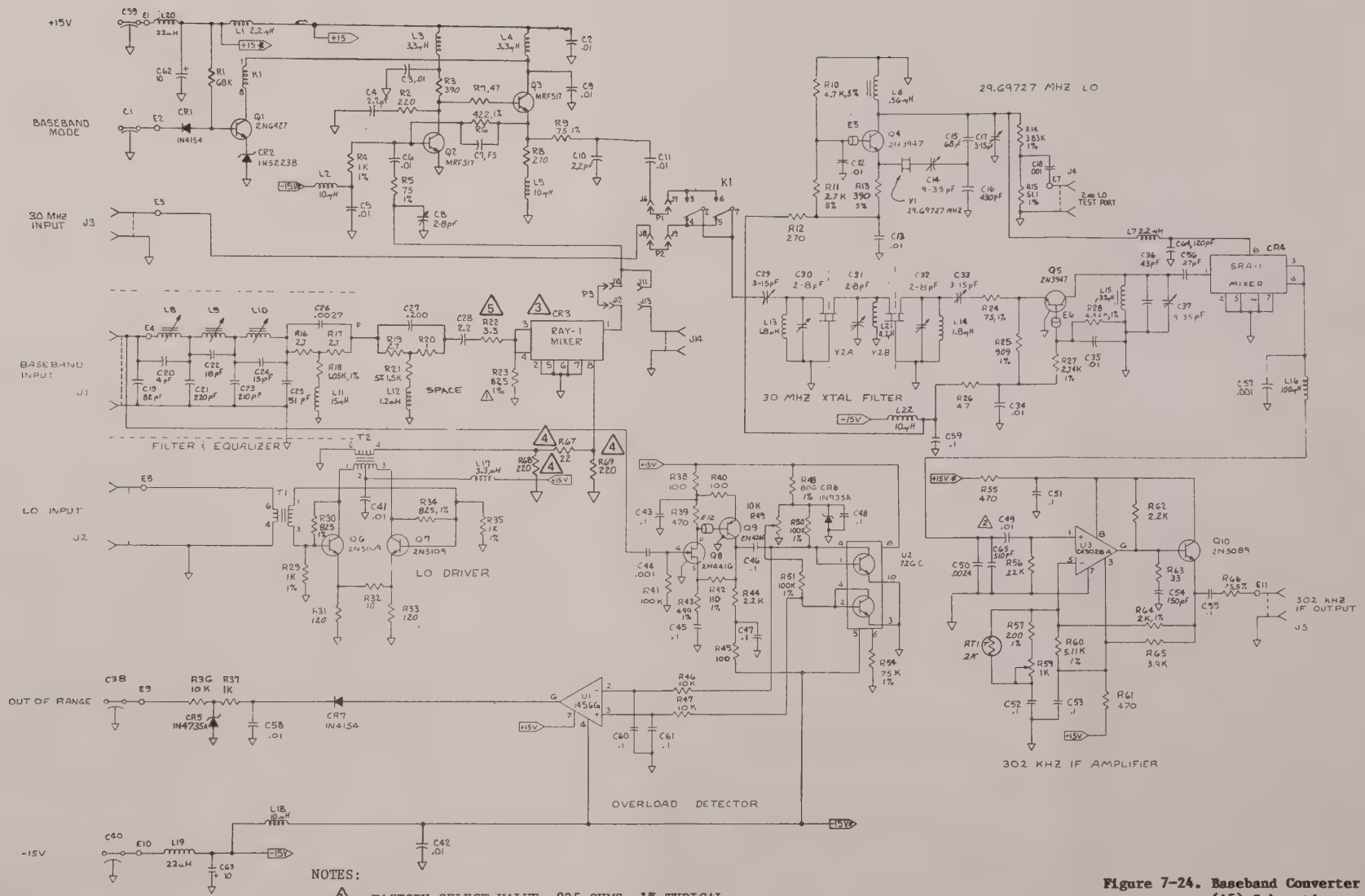




⚠1 INSTALL BETWEEN J6-J7
⚠2 INSTALL BETWEEN J8-J9
⚠3 INSTALL BETWEEN J10-J12

FROM	TO	WIRE TYPE
J1	E4	22 BUSS
J2	E8	22 BUSS
J3	E3	22 BUSS
C38	E9	22 BUSS
C1	E2	22 BUSS
C39	E1	22 BUSS
C40	E10	22 BUSS
J4	E7	22 BUSS
J5	E1	22 BUSS

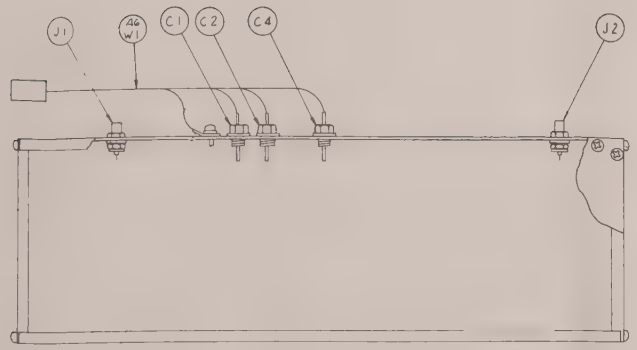
Figure 7-23. Baseband Converter Module (A5), Component Location



NOTES:

1. FACTORY SELECT VALUE, 825 OHMS, 1% TYPICAL.
2. C65 IS FACTORY SELECT. TYPICAL VALUE SHOWN.
3. CR3 MAY BE A RAY-3 MIXER ON SERIAL NUMBER 288 THRU 353 (APPROXIMATELY).
4. APPLIES TO SERIAL NUMBER 354 AND ABOVE (APPROXIMATELY).
5. APPLIES TO SERIAL NUMBER 407 AND ABOVE (APPROXIMATELY).

Figure 7-24. Baseband Converter Module (A5), Schematic



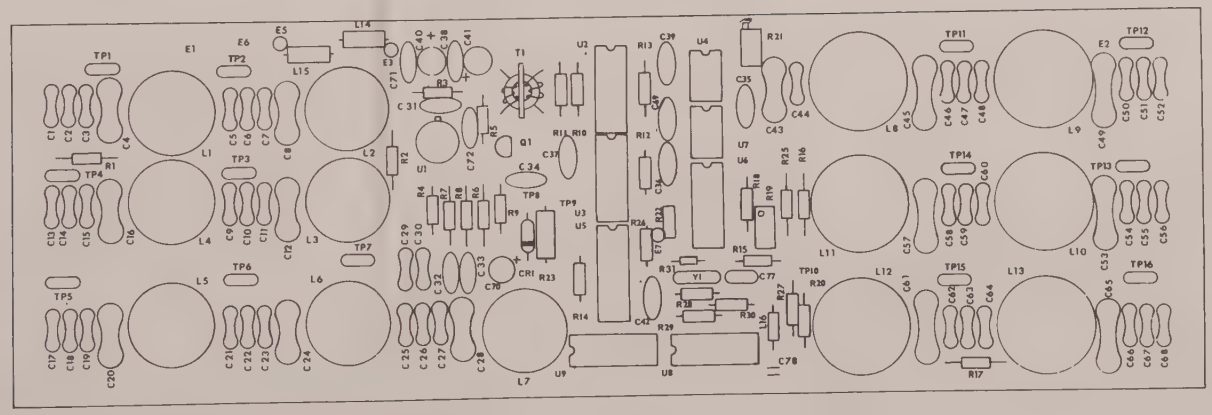


Figure 7-25. 302 kHz IF Module (A6), Component Location

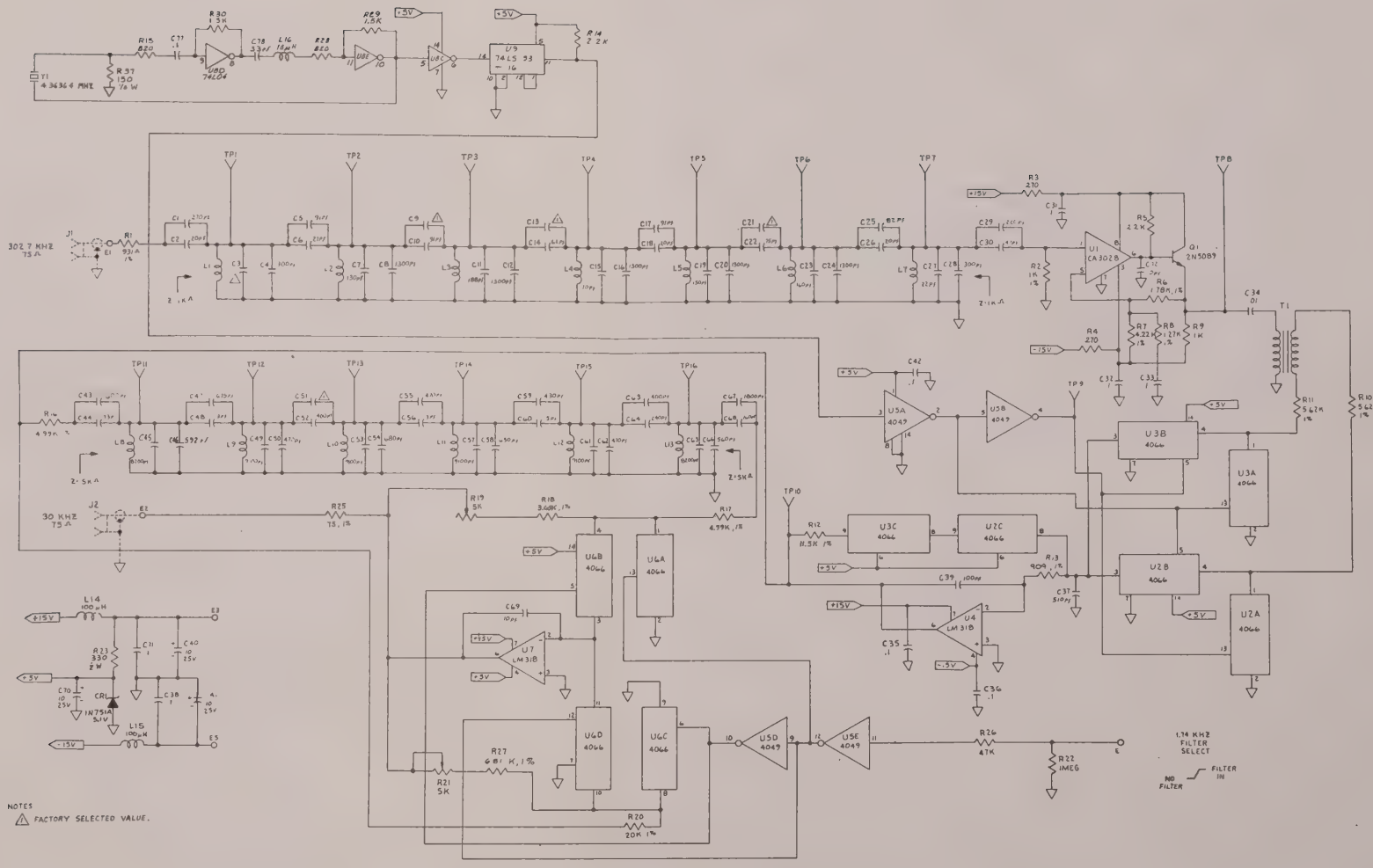


Figure 7-26. 302 kHz IF Module (A6), Schematic

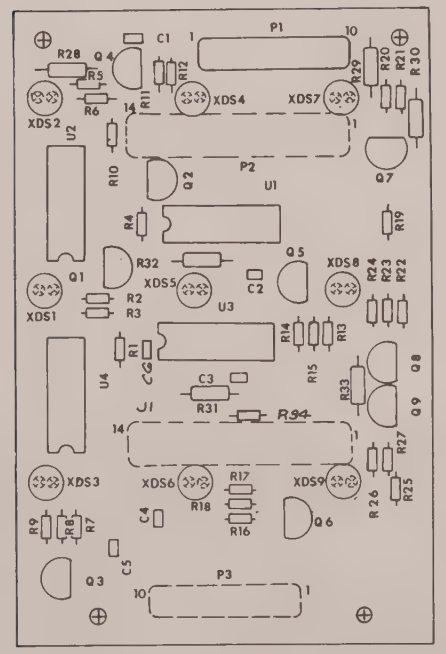


Figure 7-27. Lamp Logic Printed Circuit Board (A7), Component Location

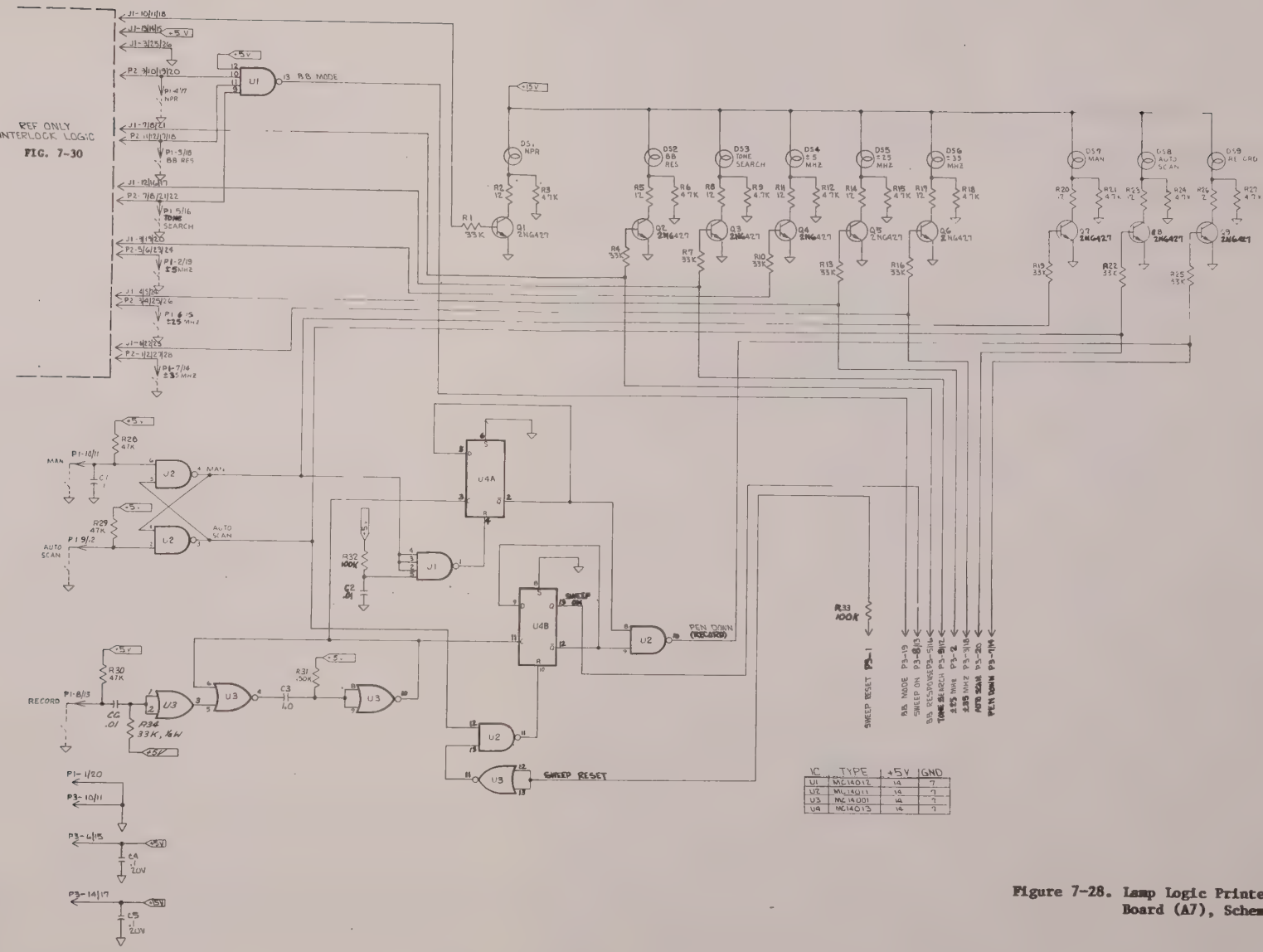


Figure 7-28. Lamp Logic Printed Circuit Board (A7), Schematic

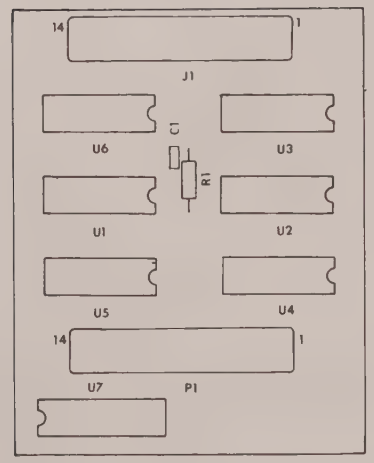


Figure 7-29. Interlock Logic Printed Circuit Board (A7A1), Component Location

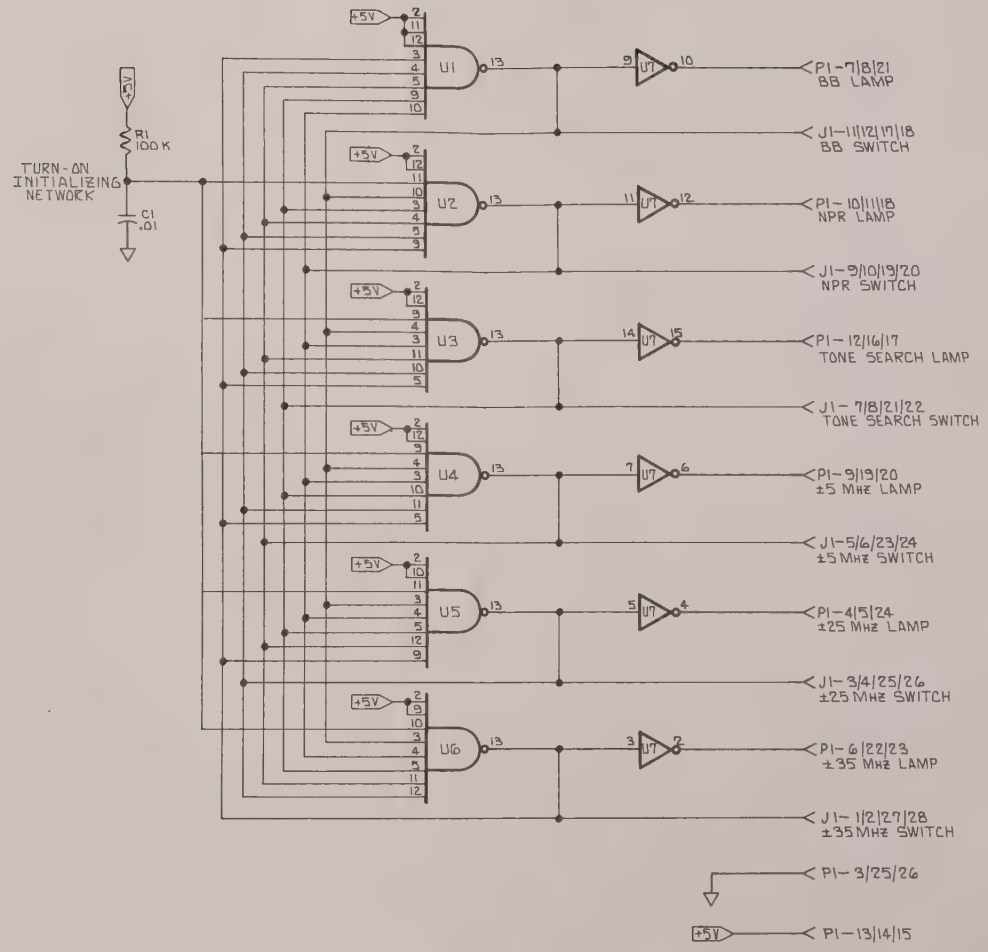
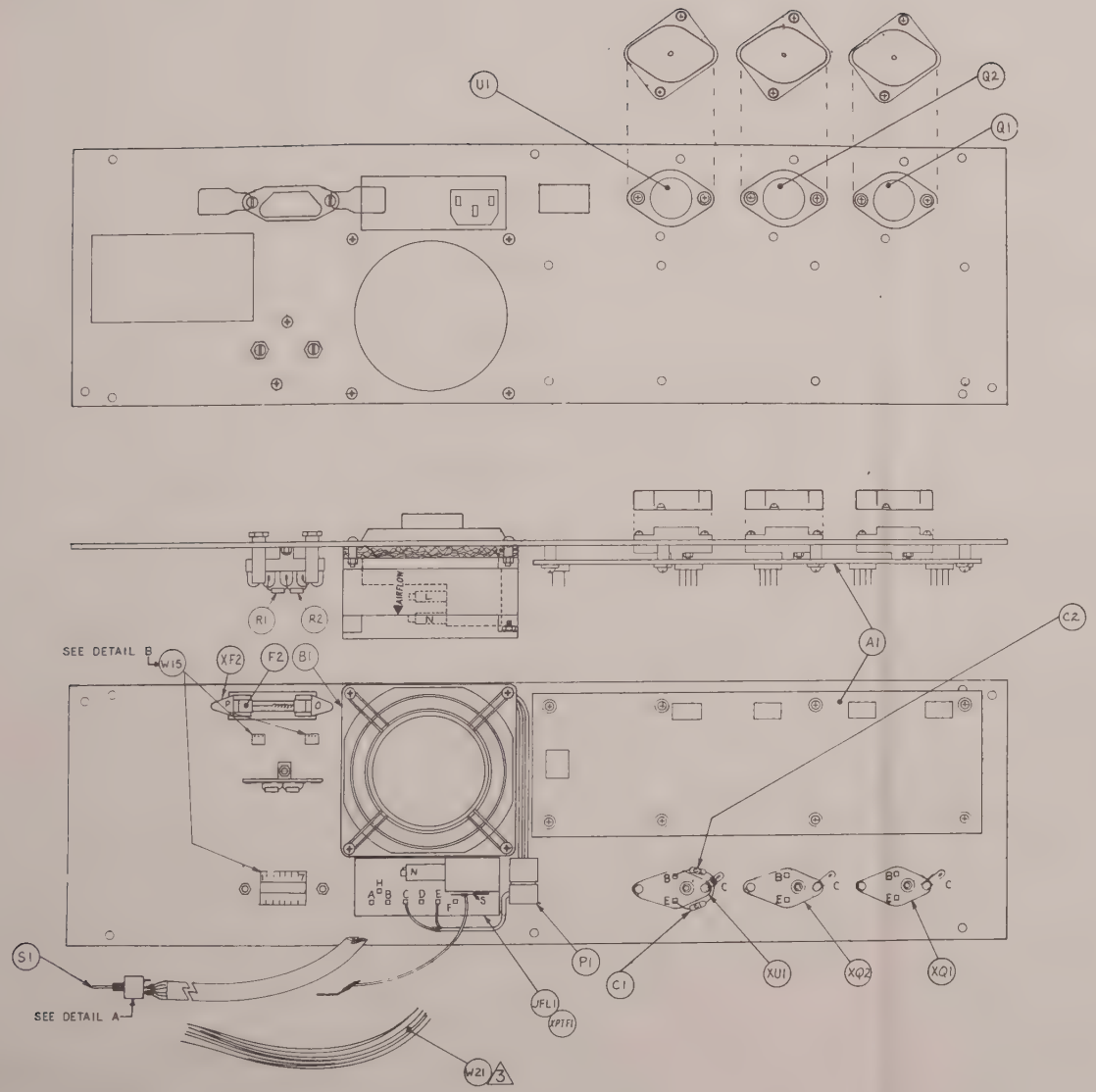


Figure 7-30. Interlock Logic Printed Circuit Board (A7A1), Schematic



SOLDER CONNECTION CHART FOR ITEM W21			
COLOR	AWG	ITEM	POINT
BRN	20	JFL1	C
RED		JFL1	E
ORN		JFL1	D
YEL	20	JFL1	F
WHT/PNK	22	XU1	B
WHT/YEL		XU1	E
BLK		XU1	C
RED		XQ2	B
WHT/RED		XQ2	E
PNK		XQ2	C
VIO		XQ1	B
ORN		XQ1	E
WHT/VIO		XQ1	C
WHT/PNK	22	XF2	0

JUMPER CONNECTION						
COLOR	AWG	ITEM	POINT	TO	ITEM	POINT
WHT/PNK	22	XU1	B	→	XF2	P

SOLDER CONNECTION CHART FOR ITEM 26		
COLOR	ITEM	POINT
GRN	JFL1	N
RED	JFL1	L
BLK	JFL1	H
CLR	JFL1	B
SHIELD	JFL1	S

R3-R4 SOLDER CONNECTION CHART	
R3	TERMINAL CONNECTION
COLOR	
RED	A
YEL	B
R4	
COLOR	
RED	E
YEL	D

3 INSTALL ITEM W21 PER CHART.
4 INSTALL RED WIRE DETAIL B, PIN E.
INSTALL VIO WIRE DETAIL B, PIN A.

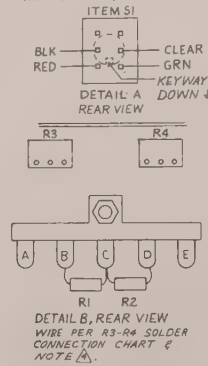


Figure 7-31. Rear Panel Assembly (A8), Component Location

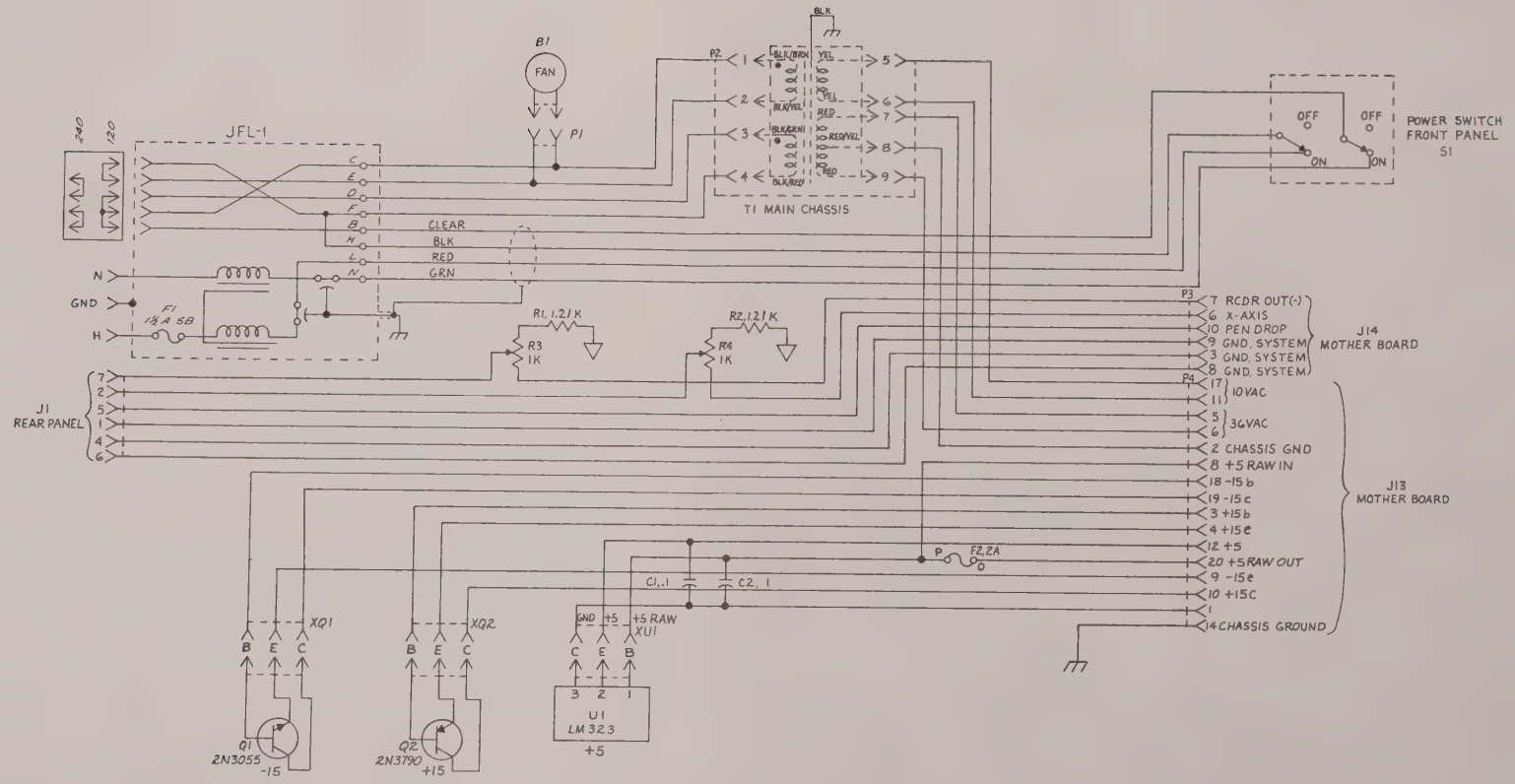


Figure 7-32. Rear Panel Assembly (A8), Schematic

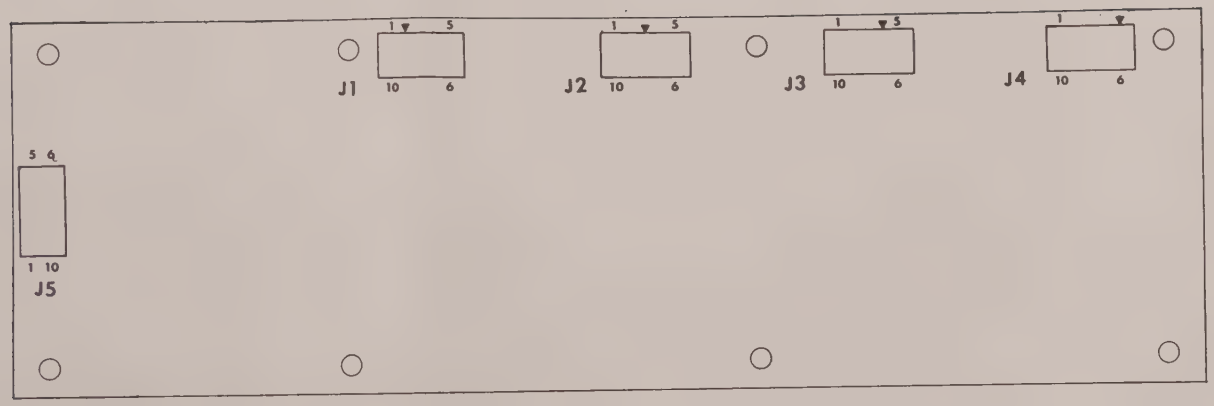


Figure 7-33. Rear Panel RF Interface Assembly (A8A1), Component Location

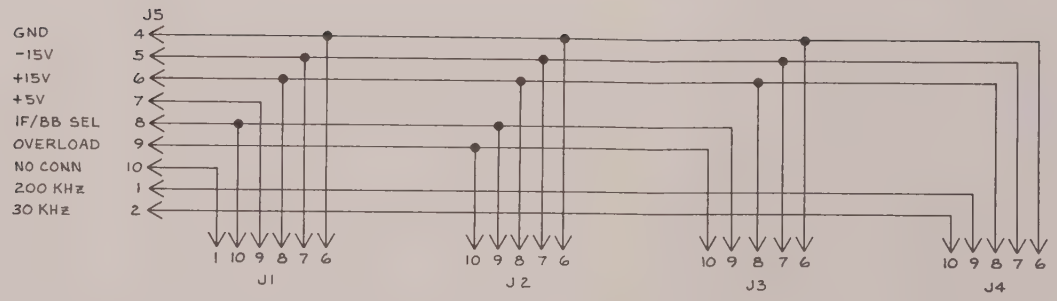


Figure 7-34. Rear Panel RF Interface Assembly (A8A1), Schematic

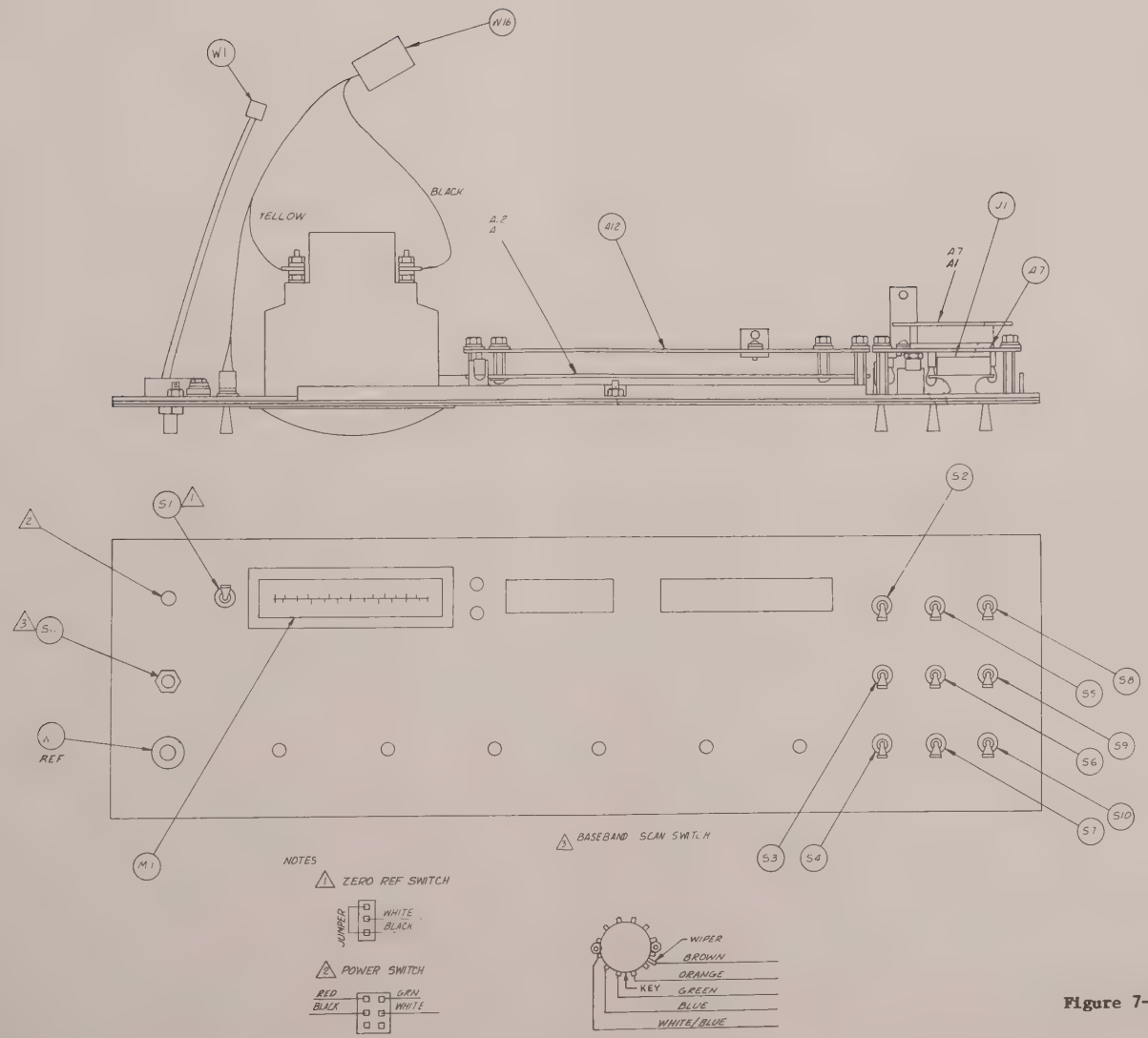


Figure 7-35. Front Panel Assembly (A9), Component Location

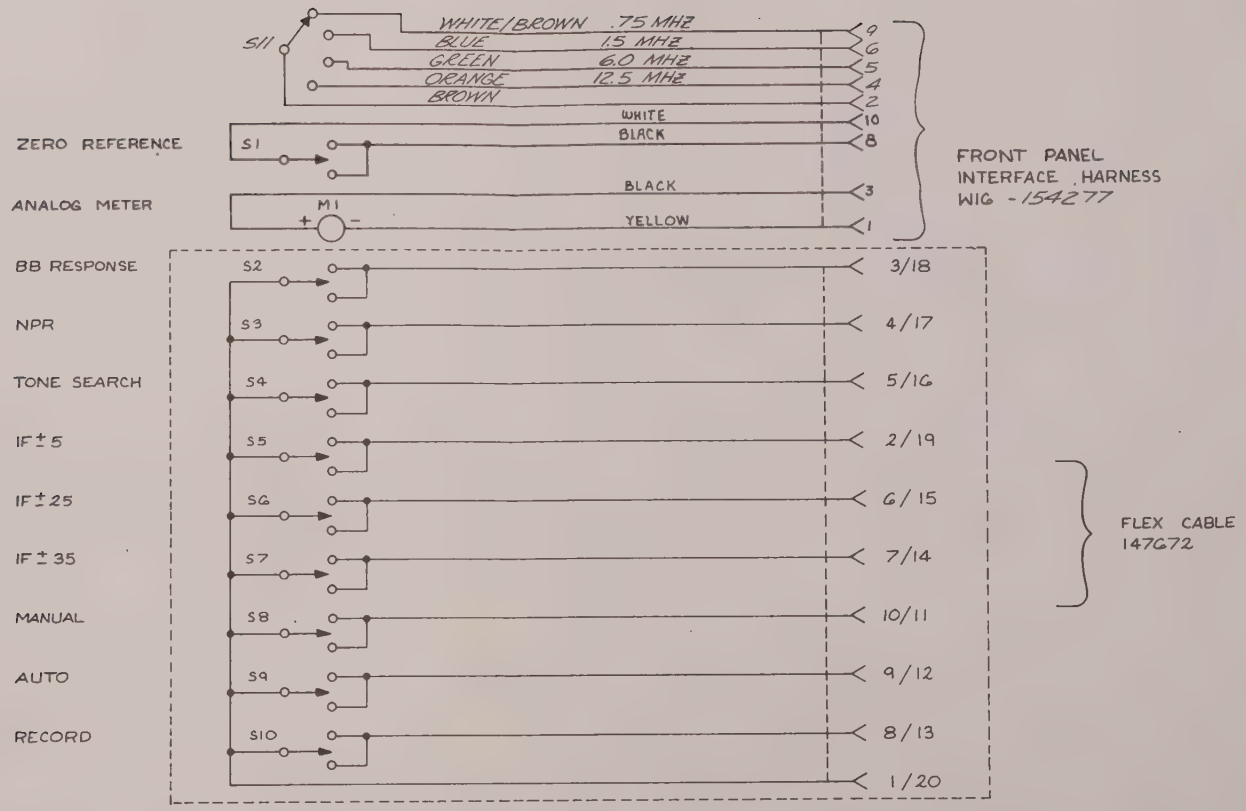


Figure 7-36. Front Panel Assembly (A9), Schematic

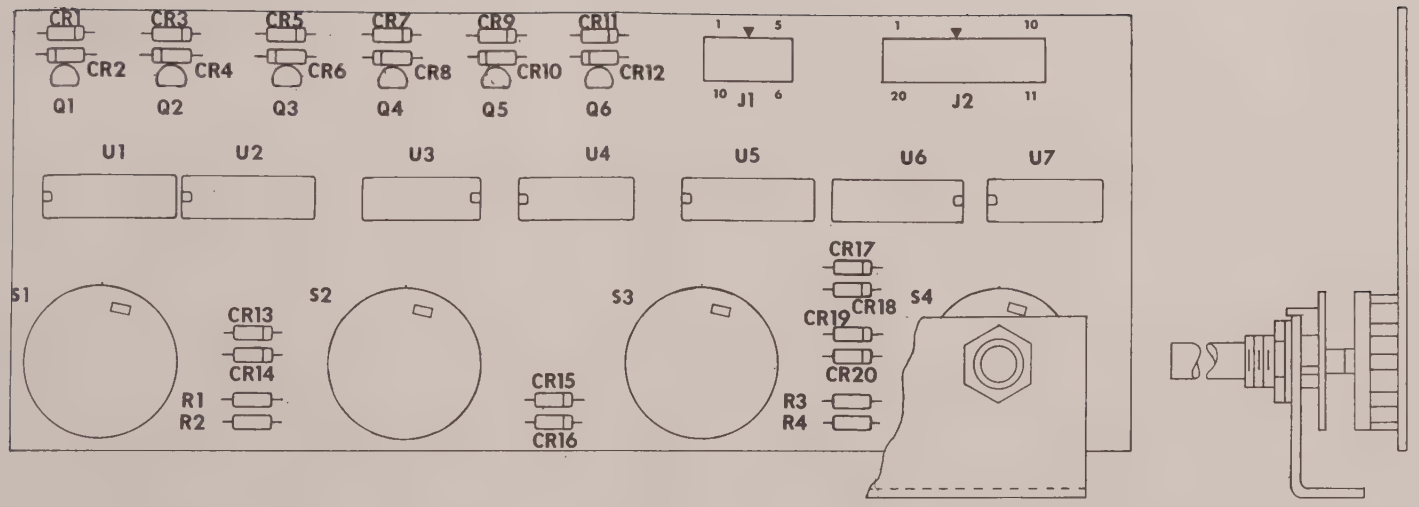


Figure 7-37. Attenuator Logic Assembly (A11), Component Location

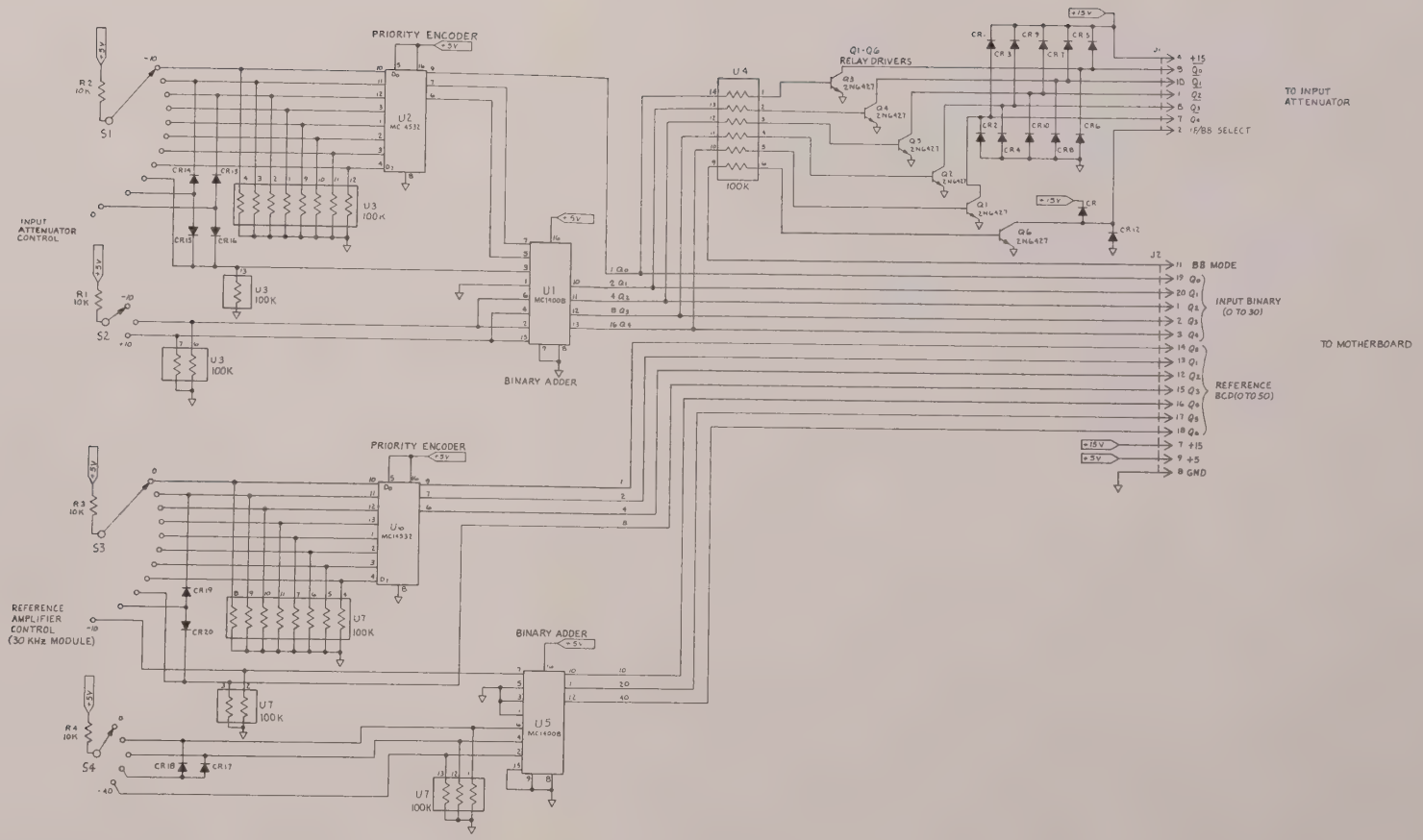


Figure 7-38. Attenuator Logic Assembly (A11), Schematic

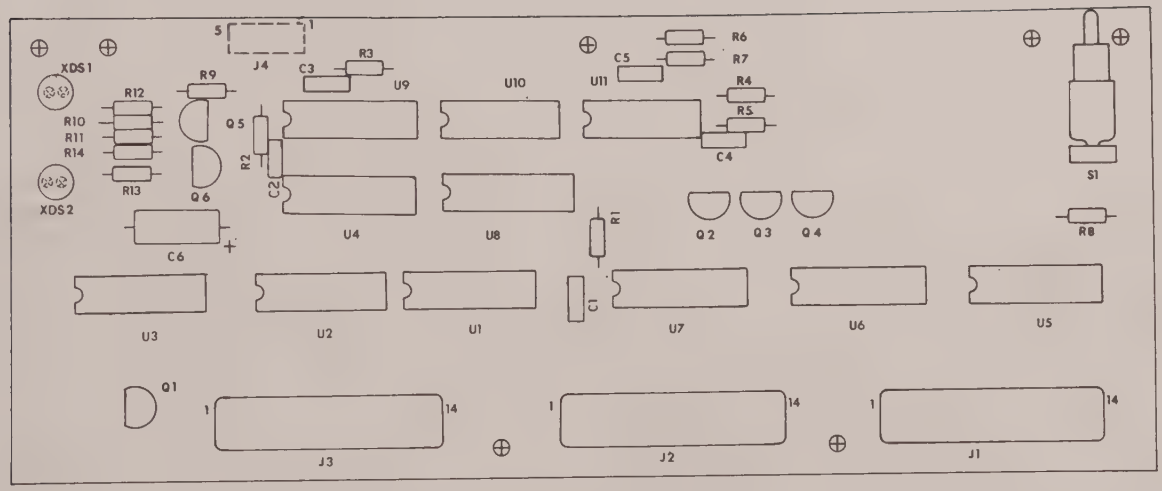


Figure 7-39. Display Interface Printed Circuit Board (A12), Component Location

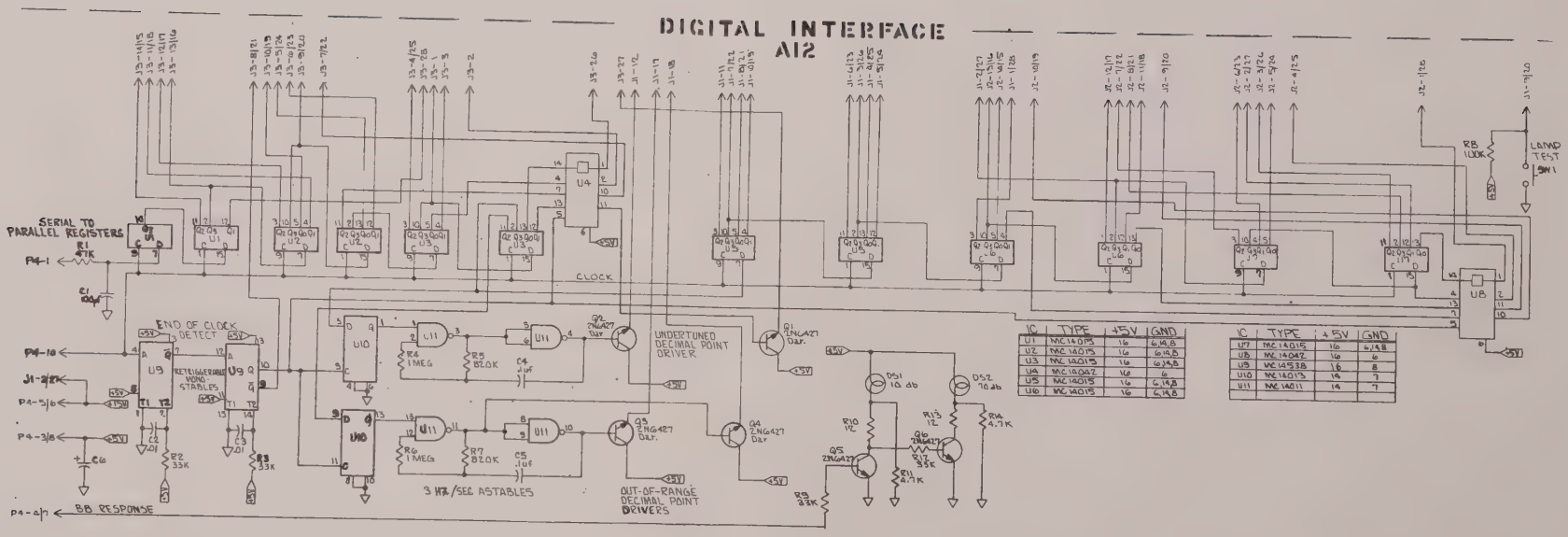

DIGITAL INTERFACE
A12
SERIAL TO PARALLEL REGISTERS
CLOCK
END OF CLOCK DETECT
RETRIGGERABLE MONO-STABLES
UNDERTUNED DECIMAL POINT DRIVER
OUT-OF-RANGE DECIMAL POINT DRIVERS
3 HZ/SEC ASTABLES
BB RESPONSE
LAMP TEST SW1
IC | TYPE | +5V | GND
U1 | MC14015 | 16 | 6,14,8
U2 | MC14015 | 16 | 6,14,8
U3 | MC14015 | 16 | 6,14,8
U4 | MC14042 | 16 | 6
U5 | MC14015 | 16 | 6,14,8
U6 | MC14015 | 16 | 6,14,8
U7 | MC14015 | 16 | 6,14,8
U8 | MC14042 | 16 | 6
U9 | MC14538 | 16 | 8
U10 | MC14013 | 14 | 7
U11 | MC14011 | 14 | 7

Figure 7-40. Display Interface Printed Circuit Board (A12), Schematic

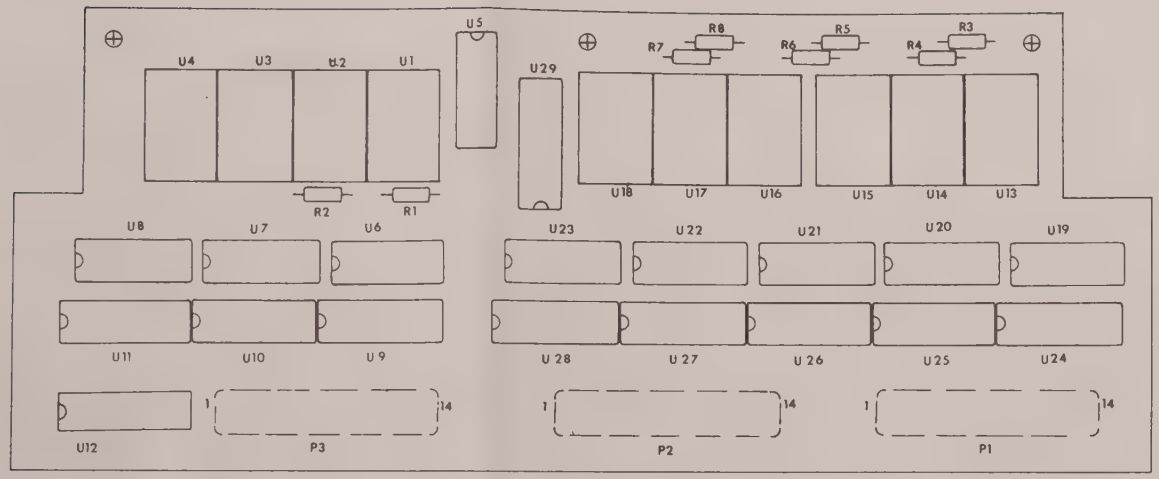


Figure 7-41. Digital Display Printed Circuit Board (A12A1), Component Location

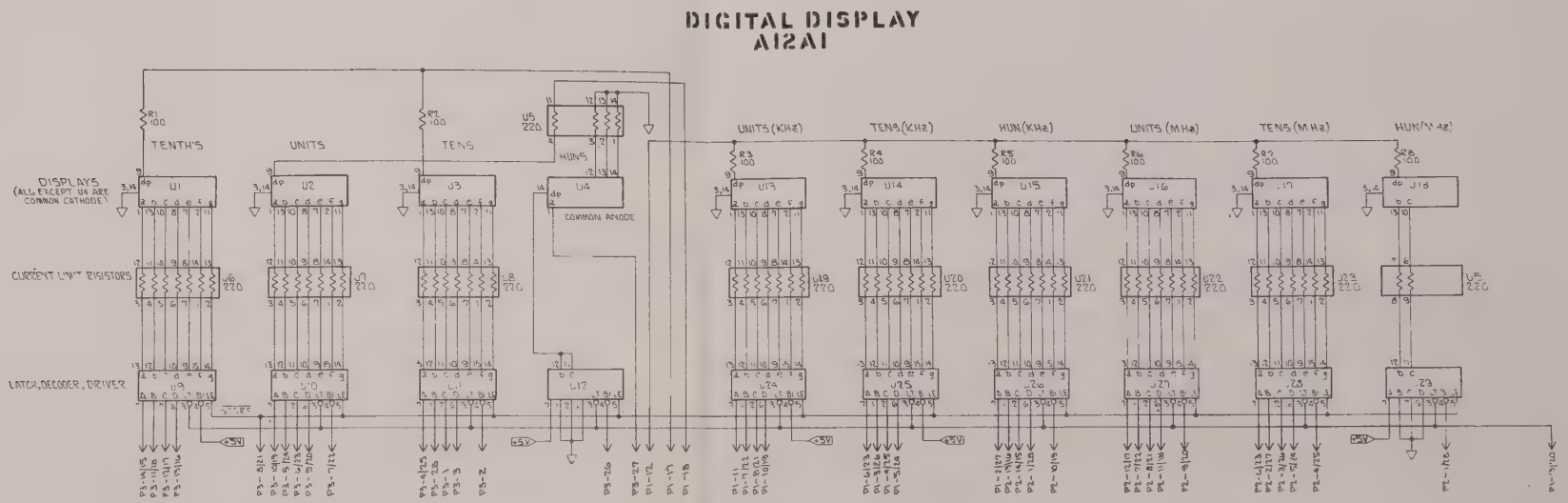
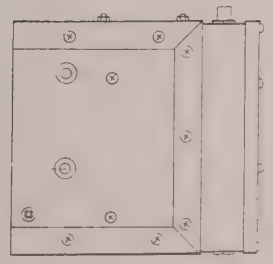
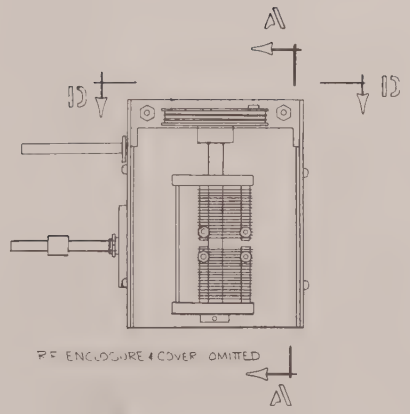
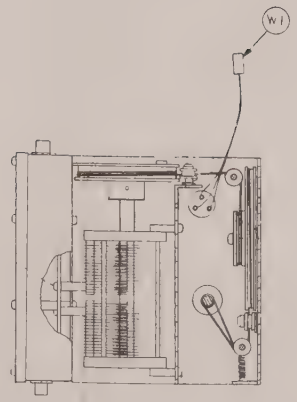


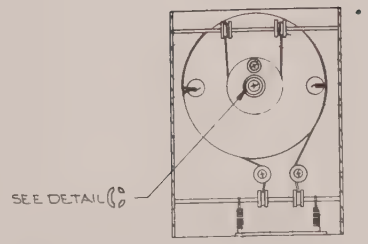
Figure 7-42. Digital Display Printed Circuit Board (A12A1), Schematic



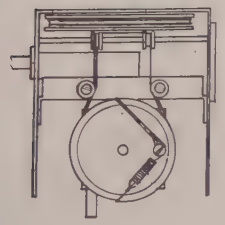




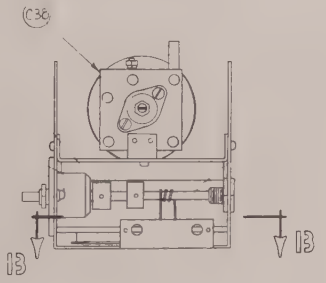
SECTION A-A



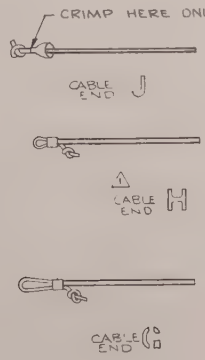
SECTION B-B



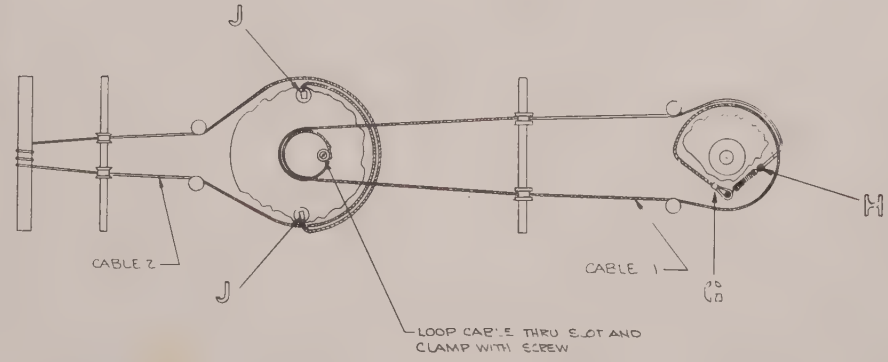
SECTION D-D



RF ENCLOSURE & COVER OMITTED FOR CLARITY

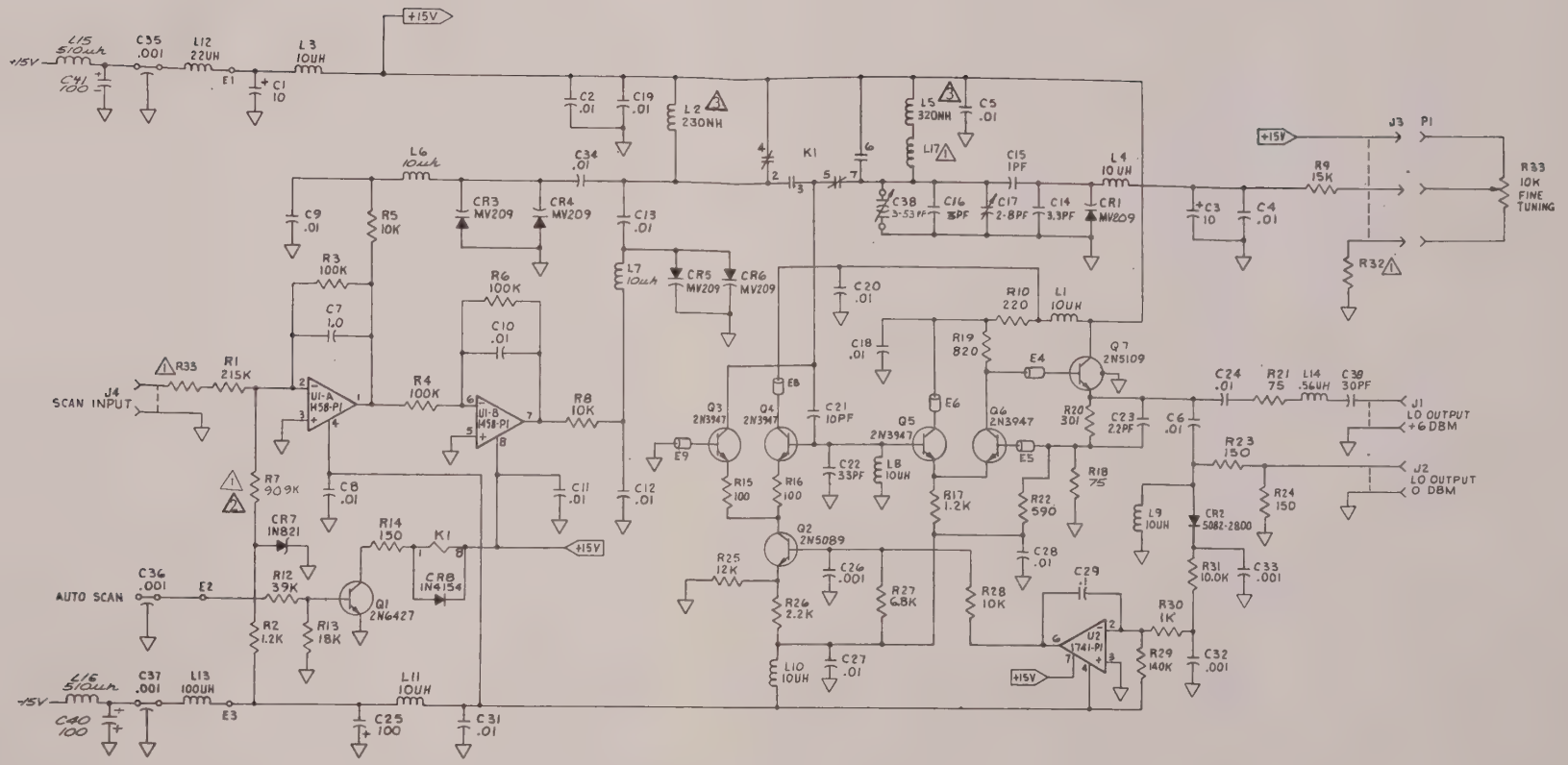


FRONT OF UNIT



CABLE ROUTING DIAGRAM
(NO SCALE)

Figure 7-44. Baseband Local Oscillator Module (A13), Component Location



NOTES:

⚠ FACTORY SELECT

⚠ R7 IS FACTORY SELECT. TYPICAL VALUE SHOWN.
RANGE OF ADJUSTMENT IS 75K-90.9K 1% TYPICALLY.
R7 IS 75K OHMS ON SERIAL NUMBER 412 AND BELOW (APPROXIMATELY).
R7 IS 84.5K OHMS ON SERIAL NUMBER 413 THROUGH 428 (APPROXIMATELY).

⚠ L2 IS .25 UH, L5 IS .30 UH ON SERIAL NUMBER 412 AND BELOW (APPROXIMATELY).

Figure 7-43. Baseband Local Oscillator Module (A13), Schematic

CONVERSION OF VOLTAGE AND POWER RATIOS TO DECIBELS

The basic chart below indicates the number of decibels (dB) corresponding to the listed ratios of voltage or power over the range of −20 to +20 dB. For voltage or power ratios greater than those included in the chart, the ratio can be broken down into a product of two numbers, the value in dB for each found separately, and the two results added. Example: To convert a power ratio of 2,000:1 to dB, express 2,000 as 2×10^3; the number of dB corresponding to a power ratio of 2 is very nearly 3, and the number of dB for a power ratio of 10^3 is 30. Therefore, the power ratio of 2,000:1 is approximately 30 dB + 3 dB = 33 dB. In the lower righthand corner of the chart dB values for voltage and power ratios of integral powers of 10 are given.

Voltage Ratio	*Power Ratio*	*−dB +*	*Voltage Ratio*	*Power Ratio*	*Voltage Ratio*	*Power Ratio*	*−dB +*	*Voltage Ratio*	*Power Ratio*	*Voltage Ratio*	*Power Ratio*	*−dB +*	*Voltage Ratio*	*Power Ratio*
1.000	**1.000**	**0**	**1.000**	**1.000**	**.447**	**.200**	**7.0**	**2.239**	**5.012**	**.200**	**.0398**	**14.0**	**5.012**	**25.12**
.989	.977	.1	1.012	1.023	.442	.195	7.1	2.265	5.129	.197	.0389	14.1	5.070	25.70
.977	.955	.2	1.023	1.047	.437	.191	7.2	2.291	5.248	.195	.0380	14.2	5.129	26.30
.966	.933	.3	1.035	1.072	.432	.186	7.3	2.317	5.370	.193	.0372	14.3	5.188	26.92
.955	.912	.4	1.047	1.096	.427	.182	7.4	2.344	5.495	.191	.0363	14.4	5.248	27.54
.944	.891	.5	1.059	1.122	.422	.178	7.5	2.371	5.623	.188	.0355	14.5	5.309	28.18
.933	.871	.6	1.072	1.148	.417	.174	7.6	2.399	5.754	.186	.0347	14.6	5.370	28.84
.923	.851	.7	1.084	1.175	.412	.170	7.7	2.427	5.888	.184	.0339	14.7	5.433	29.51
.912	.832	.8	1.096	1.202	.407	.166	7.8	2.455	6.026	.182	.0331	14.8	5.495	30.20
.902	.813	.9	1.109	1.230	.403	.162	7.9	2.483	6.166	.180	.0324	14.9	5.559	30.90
.891	**.794**	**1.0**	**1.122**	**1.259**	**.398**	**.159**	**8.0**	**2.512**	**6.310**	**.178**	**.0316**	**15.0**	**5.623**	**31.62**
.881	.776	1.1	1.135	1.288	.394	.155	8.1	2.541	6.457	.176	.0309	15.1	5.689	32.36
.871	.759	1.2	1.148	1.318	.389	.151	8.2	2.570	6.607	.174	.0302	15.2	5.754	33.11
.861	.741	1.3	1.161	1.349	.385	.148	8.3	2.600	6.761	.172	.0295	15.3	5.821	33.88
.851	.724	1.4	1.175	1.380	.380	.145	8.4	2.630	6.918	.170	.0288	15.4	5.888	34.67
.841	.708	1.5	1.189	1.413	.376	.141	8.5	2.661	7.079	.168	.0282	15.5	5.957	35.48
.832	.692	1.6	1.202	1.445	.372	.138	8.6	2.692	7.244	.166	.0275	15.6	6.026	36.31
.822	.676	1.7	1.216	1.479	.367	.135	8.7	2.723	7.413	.164	.0269	15.7	6.095	37.15
.813	.661	1.8	1.230	1.514	.363	.132	8.8	2.754	7.586	.162	.0263	15.8	6.166	38.02
.804	.646	1.9	1.245	1.549	.359	.129	8.9	2.786	7.762	.160	.0257	15.9	6.237	38.90
.794	**.631**	**2.0**	**1.259**	**1.585**	**.355**	**.126**	**9.0**	**2.818**	**7.943**	**.159**	**.0251**	**16.0**	**6.310**	**39.81**
.785	.617	2.1	1.274	1.622	.351	.123	9.1	2.851	8.128	.157	.0246	16.1	6.383	40.74
.776	.603	2.2	1.288	1.660	.347	.120	9.2	2.884	8.318	.155	.0240	16.2	6.457	41.69
.767	.589	2.3	1.303	1.698	.343	.118	9.3	2.917	8.511	.153	.0234	16.3	6.531	42.66
.759	.575	2.4	1.318	1.738	.339	.115	9.4	2.951	8.710	.151	.0229	16.4	6.607	43.65
.750	.562	2.5	1.334	1.778	.335	.112	9.5	2.985	8.913	.150	.0224	16.5	6.683	44.67
.741	.550	2.6	1.349	1.820	.331	.110	9.6	3.020	9.120	.148	.0219	16.6	6.761	45.71
.733	.537	2.7	1.365	1.862	.327	.107	9.7	3.055	9.333	.146	.0214	16.7	6.839	46.77
.724	.525	2.8	1.380	1.905	.324	.105	9.8	3.090	9.550	.145	.0209	16.8	6.918	47.86
.716	.513	2.9	1.396	1.950	.320	.102	9.9	3.126	9.772	.143	.0204	16.9	6.998	48.98
.708	**.501**	**3.0**	**1.413**	**1.995**	**.316**	**.100**	**10.0**	**3.162**	**10.000**	**.141**	**.0200**	**17.0**	**7.079**	**50.12**
.700	.490	3.1	1.429	2.042	.313	.0977	10.1	3.199	10.23	.140	.0195	17.1	7.161	51.29
.692	.479	3.2	1.445	2.089	.309	.0955	10.2	3.236	10.47	.138	.0191	17.2	7.244	52.48
.684	.468	3.3	1.462	2.138	.306	.0933	10.3	3.273	10.72	.137	.0186	17.3	7.328	53.70
.676	.457	3.4	1.479	2.188	.302	.0912	10.4	3.311	10.96	.135	.0182	17.4	7.413	54.95
.668	.447	3.5	1.496	2.239	.299	.0891	10.5	3.350	11.22	.133	.0178	17.5	7.499	56.23
.661	.437	3.6	1.514	2.291	.295	.0871	10.6	3.388	11.48	.132	.0174	17.6	7.586	57.54
.653	.427	3.7	1.531	2.344	.292	.0851	10.7	3.428	11.75	.130	.0170	17.7	7.674	58.88
.646	.417	3.8	1.549	2.399	.288	.0832	10.8	3.467	12.02	.129	.0166	17.8	7.762	60.26
.638	.407	3.9	1.567	2.455	.285	.0813	10.9	3.508	12.30	.127	.0162	17.9	7.852	61.66
.631	**.398**	**4.0**	**1.585**	**2.512**	**.282**	**.0794**	**11.0**	**3.548**	**12.59**	**.126**	**.0159**	**18.0**	**7.943**	**63.10**
.624	.389	4.1	1.603	2.570	.279	.0776	11.1	3.589	12.88	.125	.0155	18.1	8.035	64.57
.617	.380	4.2	1.622	2.630	.275	.0759	11.2	3.631	13.18	.123	.0151	18.2	8.128	66.07
.610	.372	4.3	1.641	2.692	.272	.0741	11.3	3.673	13.49	.122	.0148	18.3	8.222	67.61
.603	.363	4.4	1.660	2.754	.269	.0724	11.4	3.715	13.80	.120	.0145	18.4	8.318	69.18
.596	.355	4.5	1.679	2.818	.266	.0708	11.5	3.758	14.13	.119	.0141	18.5	8.414	70.79
.589	.347	4.6	1.698	2.884	.263	.0692	11.6	3.802	14.45	.118	.0138	18.6	8.511	72.44
.582	.339	4.7	1.718	2.951	.260	.0676	11.7	3.846	14.79	.116	.0135	18.7	8.610	74.13
.575	.331	4.8	1.738	3.020	.257	.0661	11.8	3.890	15.14	.115	.0132	18.8	8.710	75.86
.569	.324	4.9	1.758	3.090	.254	.0646	11.9	3.936	15.49	.114	.0129	18.9	8.811	77.62
.562	**.316**	**5.0**	**1.778**	**3.162**	**.251**	**.0631**	**12.0**	**3.981**	**15.85**	**.112**	**.0126**	**19.0**	**8.913**	**79.43**
.556	.309	5.1	1.799	3.236	.248	.0617	12.1	4.027	16.22	.111	.0123	19.1	9.016	81.28
.550	.302	5.2	1.820	3.311	.246	.0603	12.2	4.074	16.60	.110	.0120	19.2	9.120	83.18
.543	.295	5.3	1.841	3.388	.243	.0589	12.3	4.121	16.98	.108	.0118	19.3	9.226	85.11
.537	.288	5.4	1.862	3.467	.240	.0575	12.4	4.169	17.38	.107	.0115	19.4	9.333	87.10
.531	.282	5.5	1.884	3.548	.237	.0562	12.5	4.217	17.78	.106	.0112	19.5	9.441	89.13
.525	.275	5.6	1.905	3.631	.234	.0550	12.6	4.266	18.20	.105	.0110	19.6	9.550	91.20
.519	.269	5.7	1.928	3.715	.232	.0537	12.7	4.315	18.62	.104	.0107	19.7	9.661	93.33
.513	.263	5.8	1.950	3.802	.229	.0525	12.8	4.365	19.05	.102	.0105	19.8	9.772	95.50
.507	.257	5.9	1.972	3.890	.227	.0513	12.9	4.416	19.50	.101	.0102	19.9	9.886	97.72
.501	**.251**	**6.0**	**1.995**	**3.981**	**.224**	**.0501**	**13.0**	**4.467**	**19.95**	**.100**	**.0100**	**20.0**	**10.000**	**100.00**
.496	.246	6.1	2.018	4.074	.221	.0490	13.1	4.519	20.42		10^{-3}	30		10^3
.490	.240	6.2	2.042	4.169	.219	.0479	13.2	4.571	20.89	10^{-2}	10^{-4}	40	10^2	10^4
.484	.234	6.3	2.065	4.266	.216	.0468	13.3	4.624	21.38					
.479	.229	6.4	2.089	4.365	.214	.0457	13.4	4.677	21.88		10^{-5}	50		10^5
.473	.224	6.5	2.113	4.467	.211	.0447	13.5	4.732	22.39	10^{-3}	10^{-6}	60	10^3	10^6
.468	.219	6.6	2.138	4.571	.209	.0437	13.6	4.786	22.91		10^{-7}	70		10^7
.462	.214	6.7	2.163	4.677	.207	.0427	13.7	4.842	23.44	10^{-4}	10^{-8}	80	10^4	10^8
.457	.209	6.8	2.188	4.786	.204	.0417	13.8	4.898	23.99		10^{-9}	90		10^9
.452	.204	6.9	2.213	4.898	.202	.0407	13.9	4.955	24.55	10^{-5}	10^{-10}	100	10^5	10^{10}
											10^{-11}	110		10^{11}
										10^{-6}	10^{-12}	120	10^6	10^{12}

Scientific-Atlanta, Inc. 3845 Pleasantdale Rd., Atlanta, Ga. 30340, Tel. 404-449-2000, TWX 810-766-4912, Telex 054-2898, Cable SCIATLADORA

Manual Update Information

This envelope is provided for filing manual update information such as corrections to text, tables, procedures, new or revised drawings, or special application notes. Please use your own filing method to list the update entries in the blank space below.

This is an interim step to provide our customers with both errata and new information for this equipment while the manual is being corrected.

MP MASTER
MA29820